THE BEST MOTIVE POWER FOR STREET RAILROADS.*

Your Committee on Motive Power would respectfully submit the following report:

The subject of propelling street cars is by no means a new field of thought, but one to which many minds have lent their most earnest endeavors, in the hope of securing some means of dispensing with the use of animal power—that being the original and most common of way of to-day.

In discussing the problem of the different motive powers proposed or adopted to accomplish this end, we have, for convenience, divided the various systems into three classes, as follows:

1. Locomotive power, applied to surface roads.
2. Elevated railroads.
3. Cable railroads.

In the brief time allowed us for the reading of this paper we will not be able to undertake, as fully as we would like, to give the details of construction and comparative costs of the various classes of motors. And indeed to do so would be very difficult, as the local influences are so varied that the question of cost to meet one case would be totally different in the next. We will have to content ourselves, therefore, with the discussion of the general principles involved in each, leaving the details for further consideration.

Before going into the subject of the different devices suggested for dispensing with animal power, we had better look at some of its defects, or, at least, the difficulties encountered.

Animal power is divided into two classes—the horse and the mule. We find, in discussing the advantages of one over the other with street railroad men, there is a wide difference of opinion on the subject; but by looking upon it from an impartial standpoint, we believe that there are certain circumstances under which horses are preferable, and others in which mules can be used to the best advantage, the difference of opinion generally being where the line should be drawn. In point of appearance horses are the most desirable, and where the traffic is very heavy, immense loads being hauled, horses having the most weight are better able to accomplish the work. This is also true when snow-storms are encountered, as the draught is very materially increased under such circumstances.

On the other hand, it is claimed that horses are much more susceptible to both blemish and disease; that the percentage of disabled horses in a given number will be three or four times that of mules.

In New Orleans, for instance, where snow-storms are rare, with no grades, where, for a large portion of the year, an excessive heat prevails, mules, beyond any question, are the best. As you go north and encounter grades and severe winters their advantage decreases, until finally you find all the advantage on the other side, horses being preferred in such cases.

By actual experiment it has been found that the expense of feeding and caring for the horse is very much more than for the mule.

One of the difficulties encountered in the use of mules is the tendency in large mules of sufficient weight to compare favorably with horses of being very slow. Mules that are said to be best adapted for use on street railroads are the medium sized ones, in which class, it is claimed, are the largest number of free drivers, which is very necessary to their successful use.

In connection with the subject of animal power, we feel that a word should be said on the subject of car-starters, since the aim in the minds of many inventors, who have spent much time and money in both trying to perfect, and, we may say, in perfecting a mechanical device, that will utilize the momentum of the car, lost in stopping, to be applied in the direction of starting the car.

This thought grows out of the fact that the great majority of people believe, and, indeed, it is a very common expression heard on board street cars that the great wear and tear of the animal is in making the start, and that when a car is in motion it requires little or no exertion on the part of the team to keep up the speed. This, to a casual observer, would appear to be the case. For instance, when you see the animal straining and tugging to start an immense load of passengers, and when started, notice, at once, the comparative ease with which they draw the same, such a conclusion seems to be the right one.

The fallacy of this is easily proven, however, when the subject is thoroughly investigated.

Regarding the durability of machinery, whether it be a cutting box or a steam engine, we should examine it when it is worn out, or, at least, when it approaches its end of usefulness, to find out and strengthen its weakest parts. Why not apply this rule in examining the worn-out horse (our machine)? We look, in doing so, for the weak points first, those points that are most susceptible to wear and tear, and we find them where? In the legs, of course. We have heard horsemen say, as we believe truly, that one body would wear out ten pair of legs in street car service.

Worn-out street car horses, as a rule, have all their parts intact at the time they are abandoned for service, except their legs. We should go a little further, and confine it to the lower part of the legs, where we find the delicate muscles and sinews that form the ankle and knee joints. These appear battered and bruised, the adjoining bone unhealthy, the hoof diseased, but otherwise an able bodied, well animal. If it were in our power to do it, we would, as with worn-out machinery, replace the worn-out parts; there would be no necessity for dispensing with animal power, as this evil remedied, our rejuvenated machine (the horse) would be a most durable one (if price of legs were not to high). This much being allowed, examine the horse in the act of starting a load to find which of the leg muscles or joints are most actively brought into service. Are they the muscles from the knee down? Are they those delicate joints? Or are they the heavy muscles of the thigh—those muscles that, in a worn-out horse, are so perfect? We think the latter, for the reason that a disabled street-car horse with the joints misshapen, and lower muscles partially disabled, is still an animal capable of pulling an immense load, slowly—going to show that its ability to start heavy weights is still perfect, the difficulty being in its power of rapid locomotion, in proof of which, horses that cannot travel fast enough to be of service, will pull the heaviest load with perfect ease, indicating that the other pulling muscles are intact, and good to the end. You have observed, perhaps, to what good use worn-out car-horses can be put on farm work—ploughing and the heaviest sort of hauling. The greatest draught-horses are very often from the worn-out street-car horses, where no speed is required, but great strength. A horse will pull a plough or heavily loaded wagon nine or ten miles a day, and yet ten or fifteen miles' travel on a street railroad is all we can reasonably hope to get as a day's work. If our data are true, then that in a worn-out horse we find those muscles in a perfect state that are brought in action in starting a load, and the defective muscles and joints those that facilitate him in speedy travel, it would also follow as a logical conclusion that the great strain and tugging in the starting of a load is not nearly so injurious as that "hammer, hammer, hammer" on the delicate parts of the lower muscles and joints, when the horse is traveling, apparently doing no work at all.

To state the proposition in a different way—it is the miles traveled and not the load pulled (within certain limits, of course) that destroy and make our horses unfit for use. If, then, as we say, the argument is a false one, that the "great object to be attained to save horseflesh" is to avoid the strain at starting, we at once have taken away from under the car starter theory all the ground it had to stand on, and if it were possible to make a machine so simple and durable in all its parts that there could be no complaint on the score of economy, even then, in our judgment, a car starter is a failure. It is an attempt, we judge, to perfect the strongest part of a machine instead of the weakest, and, as the measure of strength is always that of the weakest, we have gained nothing.

We will next look into the subject of locomotive power applied to surface roads.

Now we are in a wide field. We have, first, the ordinary steam locomotive, built with a view of being useful in the public streets—we will say noiseless, smokeless and beautiful to the eye. Then we have the fireless locomotive, receiving its charge of steam at the end of the route from stationary boilers. We have, also, the pneumatic engine, very closely allied to the fireless engine, the difference being in a charge of compressed air in one case, and a charge of steam in the other. Electric engines are also in use, receiving their power from an electric current generated by a stationary steam engine, and transmitted to the car by utilizing the rails of the track to form part of the circuit. We have heard suggested, but never tried to our knowledge, the application of a gas engine, that utilized the explosive power of gas as a motor. All of this class of motors rely entirely upon applying motive power, so as to rotate the wheels of the car or motor, obtaining their locomotion from the friction between the wheels and the rail. In this they resemble steam railroads, but encounter difficulties that steam railroads know nothing about—our curves, being of necessity of a very much shorter radius, and grades being in the highway, are fixed by the laws of chance, or bad engineering.

Even in cases where we are fortunate enough to have a straight and level road, we still have the grit and dirt to contend with that is necessarily present in all thoroughfares. Our track being forced on a level with the surrounding road-bed, and not elevated above it, as our neighbors'; add to this the snow and ice difficulty, and you have a complete picture. For instance, a number of able-bodied passengers assisting to start a car, with the usual kind words for the management heard on such occasions.

It may be said, in answer to this, that New Orleans has had in successful operation for years steam locomotives applied to their street railroad system. While this is true, the limited way in which it has been used, never having grown at all in its many years of service, proves that even there, under the most favorable circumstances, it has not been very successful. New Orleans uses locomotives on a straight street, without a grade or curve, the track being located in that part of the street not given to the travel of other vehicles, on what is known as "neutral ground" or lawn, situated in the center of the street, on which the street railroad track is laid. They only have street grades to encounter at the intersection of cross streets.

They first adopted on this road what was known as the fireless system of steam engines, getting their heat and pressure from a stationary battery of boilers at one end of the line, obtaining from that sufficient steam to make, at least, one trip. They have since changed this by adding the fire-box to the locomotive, so as to generate its own steam.

Only under the most favorable circumstances have they been able to keep their road in successful operation with the steam motor. They have never ventured to use it in the busy part of the city.

For ordinary street car service, this system presents no advantages, to our mind, over what we have.

The same argument applies with equal force to the use of all motors of this class, namely, the inability to secure friction sufficient to propel crowded cars under difficulties, unless invention devises some means of increasing the traction of the motor beyond the weight of its load. Cog-wheels would do it; but it is absurd to think of such a thing in practical use.

We claim, in conclusion, in speaking of this class of motors that they have an insurmountable barrier to overcome, so long as they rely upon merely rotating the wheel to apply that power. In this, of course, we are taking for granted the fact that they can produce a machine of sufficient durability and simplicity to be easily controlled by the class of men ordinarily employed on street railroads.

As to elevated railroads, they are, strictly speaking, not one of our class. We are bound, however, to recognize this fact, that there is a point beyond the abilities of our ordinary system of surface roads to do the work required, and when this point is reached the elevated road becomes a necessity, especially when a great number of passengers over a given line are to be carried a long distance, in which the time occupied in making the trip the ordinary way is too lengthy—condemning, as it does, a vast community to an imprisonment in a street car for several hours a day, which in the course of a year amounts to many days. For instance, a passenger having 7 or 8 miles to travel daily from his home to his place of business and return will, on an average, consume three hours a day in a car, though he only makes the trip morning and night. This, for a year, amounts to about 30 days' car riding. The idea of being condemned to 30 days' imprisonment in a street car, even to the most ardent admirer of our profession, is not an agreeable thought.

The great expense and cumbersome appearance on the street will, of course, retard their growth until to build them becomes a necessity. In our opinion there are but few, if any, opportunities for the successful building of elevated railroads in addition to those already constructed.

We now come to the cable system of railroads. This is a system which utilizes the power of a stationary engine to operate cars at will, miles away from the source of power, transmitting the power by the medium of an endless cable to the point required, and at the necessary time. This system, in our judgment, though as yet in its infancy, is on the right road to solve the problem of dispensing with animal power; a system, instead of a disadvantage, and less serviceable on heavy grades, and in the midst of snow storms, furnishes at such times a superabundance of speed and ability to resist obstacles; a system that does not depend upon the friction between the wheels and the rails for its power of locomotion; a system that enables street railroads to handle immense crowds by the simple addition of a few more bushels of coal and the putting on of extra cars without the fear of overloading its animals, and killing more in one day than its profit would be in a month; giving us, in other words, more latitude in the way of economizing in dull times, without having horses to feed, or not, and furnishing ample means of expansion on short notice, without the necessity of hiring extra animals on such occasions.

Do not mistake our eulogy of this system by believing that we are blind to its faults, as it is of its faults that we desire, most fully, to be heard, hoping that in the discussion of the difficulties in its way we may encourage the already stupendous efforts in the direction of curing them. We realize

* Report presented to the American Street Railway Association at its recent annual meeting in Chicago by the Committee on Motive Power.

that there are many with ample means laboring for the attainment of this very end.

Their success, to our mind, is but a question of time. The cable road, as it is to-day, is only available under the most favorable circumstances. First, it requires a magnificent business, for the reason that the outlay is so great that an enormous sum is eaten up in paying interest on the cost of construction. It requires a comparatively straight road for the reason that, as yet, the turning of curves in an economical and simple manner has not been accomplished, to our knowledge. There are a number of minor defects which are always found in new machinery. These can only be remedied by time and experience. But minor troubles should not discourage us in the least. our main objection being to the two points above stated—the first, the heavy outlay involved, is not so serious a matter, as we see indications of a simpler and more economical construction being developed. Add to this the very low price steel has reached, with a still downward tendency, we are of opinion that the cost of roadbed construction, will, in a short time, be greatly reduced. As to the difficulty they have in accomplishing curves, we are quite sure that invention will device some means of curing the evil. The system as it is now, has its first objection the great expense in the maintenance of auxiliary cables; but with all its defects, its gives to us great hope.

We believe, in conclusion, that the only practical means presented to our view of dispensing with animal power is the cable system. At present the cable road is confined to a few favorable localities, but rapid strides are being made in the direction of its perfection, which will surely result in bringing this motive power within the reach of roads less favorably located.

Concluding, we will add: Beware of "car starters," and lend a helping hand to those trying to perfect that system which is at present our only hope for dispensing with the noise and expense of animal power.

THE WISCONSIN CAPITOL DISASTER.

MADISON, Wis., Nov. 21.—The jury after an eight-hour session agreed upon a verdict at five o'clock this morning for the causes of the death of the victims at the recent disaster at the Capitol. Justice Brown was at once summoned, and the sentence read in open court.

The jury found that the internal construction was such as to contribute to its detraction during the process of erection, that the piers were weak, and such fact was known to the contractors.

O. F. Nowlan, of Janesville, Wis., superintending contractor, by causing said pier to be improperly repaired, contributed to the falling of the south wing, and was found guilty of gross negligence and error.

Supervising Architect D. R. Jones, of Madison, and Consulting Architect H. C. Koch, of Milwaukee, were found guilty of negligence in designing the internal construction of said south wing, without a proper guard for its safety during the erection, and thereby contributed to its falling, on Nov. 8, 1883.

The jury, after personally affirming to the verdict, were dismissed.

THE CATASTROPHE.

The entire roof, together with the inside walls and iron and stone columns of the new south wing of the Capitol at Madison, Wis., fell at twenty minutes before two o'clock p. m. on Nov. 8, killing six men and injuring twenty others. The cause of the accident was attributed by experts to the fact that the heavy iron pillars supporting the roof of the second story balcony sank into the plank on which they were rested, thus pulling the sound wall outward, which in turn caused the roof of the entire wing to cave in. These columns were made of large pieces of boiler iron rolled into circular form, stovepipe fashion, the jointures not being bolted together.

LESS MONEY GOING INTO RAILROADS.

Railroad construction, like everything else in this country, goes by waves. One of these undulations showed its crest in 1856, another in 1871, and the third, it is evident from the figures of construction, reached its top in 1882. Each of these waves has rolled higher than its predecessors. In 1856 we built 3,647 miles; in 1874, 7,379; and in 1882, 11,591. After the panic of 1857 the annual addition to the railroad system dropped to its lowest point in 1861, when but 651 miles of new road were built. After the panic of 1873 the bottom came in 1875, with but 1,712 miles. What will be the year and what the mileage at the end of the wave that is now ebbing, who can tell?

At the rate of construction for the last ten months the end of this year will see a new mileage of not much more than half that laid last year. The figures for the year up to the 1st of November are, according to the *Railroad Gazette*, 5,279 miles, being 3,692 less than for the corresponding period last year, and railroad construction has now nearly ceased for the season. The Northern Pacific, which at this time last year was straining every arm to push along its track, is done, as is the Lackawanna. The West Shore is almost completed. There are no more great enterprises being hurried to the last spike. The record for the next year will certainly be a still more slender one. There is an almost complete cessation of new projects flattering the capitalists with the promise of enormous construction and stock-exchange profits.

For several years after 1875 the yearly addition to the mileage of the United States was but an average of about 2,500 miles a year. That was before the great work of finishing the Northern Pacific and of building the Nickel-Plate, the West Shore, the Lackawanna, the Southern Pacific, the Texas roads, the roads into Mexico, the new systems of the South, the Dakota roads, the lines needed to carry the immigration that began to flow into the West and Northwest had been undertaken. All that work has now been done or is in its last stages. The gridironing of the country has been pretty thoroughly accomplished. Any one who wishes to get a vivid idea of this should sit himself down before a map, fancy himself a "promoter," and try to find a likely place for a new road to be built by a syndicate and bought at 200 cents on the dollar by the lambs.

Certainly no new trunk lines are needed to carry the produce of the West to the East. The extensions of the Grand Trunk, the Erie, the Lackawanna, the new West Shore, the Chesapeake & Ohio have more than met this want. The great need now is not for more roads but for more business. The problem now is the pool problem—how to divide up the scanty traffic so as to put a piece of it into every hungry corporate maw and avoid a railroad war. No more roads are wanted to California. There are now more than are necessary to do the work, and the roads already on the ground have to divide up the territory in order to prevent competition. Ample provision has been made for all the roads that will be required to do the trade of this country with Mexico. The comparatively sparse population of the South has received pretty much all the new mileage it can sustain for the present. The Southwest, if we may judge from the measures taken recently by Mr. Gould to conceal the fluctuations in the earnings of his system, can get along very well without any more watered stocks and construction companies. Perhaps the Northwestern and the St. Paul companies can find a new place for paralleling each other, but we doubt whether either will think it worth while to do so.

This survey of the whole field that has offered such attractions to the energy and genius of the railroad *entrepreneur* for the last four or five years makes it manifest that he has had his day. When the panic of 1873 struck this country the West was inadequately supplied with steam roads. But this is so no longer. The operations of the last few years have gone far toward opening all the main avenues needed for the Upper Mississippi Valley. Hundreds of miles will have to be built every year for a long while to give access to new coal-fields, to new agricultural districts, but the principal routes have been laid out. The filling-in process will go on slowly with the spread of population and the needs of various communities, and will be a very different thing from the fervid enthusiasm which in little more than a generation has overlaid a whole continent with iron highways.

Fewer miles of railroad almost by half have been built this year than last, and fewer still will be put down next year. Probably still fewer the year after. North, South, East, West, up Canada way, and down Mexico way, where is there a call for anything more than spurs and branches and connecting links? The consequences of this subsidence of the flow of money into railroad building are certain to be far reaching. Upward of $1,100,000,000 of cash, making all allowance for the watering of the stocks, has been invested in this work in the last four years. Iron furnaces, steel-mills, car-shops, locomotive-works, machine-shops have been set going all over the country, gauged to meet a demand at the high-water mark of 1882. Labor has turned by the tens of thousands into railroad channels. But it is as certain as anything can be that the pace of 1882 is not to be kept up—not by one-half. Tens of millions of capital invested in the industries auxiliary to railroad building must relapse into idleness. The laborers thrown out of work must stand still in droves, or must push into the places of men in other lines of employment.

This is a gloomy outlook, but there may be a bright streak in it. This is a very rich country, the richest, beyond a doubt, in the world. Our railroad building has by no means exhausted our wealth or our energies. Capital, through all the dullness of trade and of manufactures and the arrest of railroad building, is yet accumulating. Idle bank accounts are piling up. Any one who wishes to see one of the new fields opening up for the employment of labor and capital should take a horse and buggy and drive an hour or two about Chicago and acquaint himself with the extraordinary amount of building going on. Other cities offer the same spectacle.—*Chicago Tribune.*

THE FORTH BRIDGE.

The following is the second report of inspection by Major-General Hutchinson, R. E., and Major Marindin, R. E., of the works in progress for the construction of the bridge over the Forth:

RAILWAY DEPARTMENT, BOARD OF TRADE,
August 15, 1883.

SIR; We have the honor to report for the information of the Board of Trade, in compliance with instructions contained in the order of October 26, 1882, and in accordance with the provisions contained in section 6 of the Forth Bridge Railway Act, 1882, we have made our second quarterly inspection of the works in progress for the construction of the bridge over the River Forth at Queensferry.

Both the temporary and permanent works have made good progress since our last report, and their state is now as follows:

Temporary Works.

At South Queensferry—The gas furnaces, hydraulic engines and accumulator, hydraulic bending machine and planing machine for the large plates, two shop engines, shafting, etc., large turning and screwing machine for holding down bolts, one large traveling crane, and one 10-drill machine for the 12-foot tubes are either at work or can be started at a day's notice. Three other large drills and about 200 tons of steel plates are ready for delivery. The temporary stage on the south shore has been advanced to a distance of 1,300 ft., and the inclined approach of this stage and the winding engines for working it have been completed. Several workmen's cottages, a large canteen, reading-room, store, etc., have been erected, and are in use.

At Inchgarvie—The wrought-iron landing stage is nearly finished, a large surface of rock has been leveled as a platform for materials, and a wrought-iron viaduct 250 ft. long has been erected to connect Inchgarvie with a detached rock called Craig Sparry, on which are situated the northeast and northwest main Garvie piers.

At North Queensferry—A wrought-iron stage, 95 ft. long and 70 ft. wide, has been erected over the site of the Fife southwest main pier. This stage carries a traveler, on which are three diamond rock-drills, driven by separate engines for boring the rock, so as to obtain level foundations for the pier. The rock has been leveled round about the Fife main piers to form a platform for storing and manipulating the steel work of the cantilever, and the cottages, workshops, stores, etc., have been completed, and are in use. Eight barges, a steam barge, a steam tug, and steam launch are now in use on the works, and others are about to be delivered.

Permanent Work.

At South Queensferry—The concrete foundation of viaduct pier No. 1, averaging 11¼ ft. in depth, has been completed; at viaduct pier No. 2 the concrete foundation, 5½ ft. deep, is complete, and the granite-faced superstructure has been carried up 5 ft.; at viaduct pier No. 3 the concrete foundation, 5½ ft. deep, is complete, and the superstructure, as above, carried up 8½ ft.; at viaduct pier No. 4 the concrete foundation, 3 ft. deep, is complete, and the superstructure carried up 14 ft.; at viaduct pier No. 5 the concrete foundation, 2½ ft. deep, is complete, and the superstructure carried up 6 ft.; and at viaduct pier No. 6 (where the foundation is below low-water mark) a cofferdam is being constructed. A heavy timber dam is also in course of erection at the site of the south cantilever pier, where the depth of water at foundation level is about 20 ft. at low water.

At Inchgarvie—The excavation of rock down to the level of low water on the sites of the northeast and northwest piers is well advanced, and a start has been made with the temporary caissons to be used for work below low water.

At North Queensferry—The excavation of rock at the southwest main pier is being proceeded with, diamond drills being employed for boring; the foundation concrete to the north cantilever pier, 2½ ft. deep, is finished; at viaduct piers Nos. 10, 11, 12 and 13 the concrete foundations have been completed to the depths of 2½ ft., 2 ft., 8½ ft. and 11½ ft. respectively, and the granite-faced superstructure erected thereon to the heights of 7 ft., 3½ ft., 16½ ft. and 24 ft. respectively. The excavations for the foundations of the small masonry spans at the north end are in progress.

General Remarks.

All the holding-down bolts (576 in number) for the main piers have been delivered; they are from 24 ft. to 26 ft. long and 2¼ in. in diameter, and they have been made (at Landore) of steel stated to have a tensile strength of 30 tons per square inch, and an elongation of 20 per cent. Wrought-iron belting, 18 in. by ⅜ in., has been delivered for looping the Fife piers. The first of the large permanent caissons for the Queensferry main piers, as well as the bulk of the remaining plant required in the shops, is, we are informed, still in

progress. The air-compressors for the large caissons are nearly completed and partly delivered, and a large diving-bell for rock excavation below low-water mark is also nearly ready for delivery.

About 40,000 cu. ft. of granite have been delivered, of which about 15,000 cu. ft. have been set, and about 81,000 cu. ft. of concrete are now in position.

The progress and quality of the work, so far as we have had an opportunity of judging on our second quarterly inspection, are in every way satisfactory.—*The Architect.*

EAST RIVER BRIDGE DISASTER.

Judge McAdam, in the City Court, this week dismissed the complaint of Lizzie Hannon against the Trustees of the East River Bridge. Miss Hannon was hurt in the disaster last Decoration Day. She sought to hold the Trustees of the bridge personally responsible for damages on the ground that they had neglected to take proper precautions against disaster. Judge McAdam overrules this theory. In his opinion he says: "While it is true that when an individual sustains an injury by the misfeasance or nonfeasance of a public officer who acts or omits to act contrary to his duty, the law gives redress to the injured party by an appropriate action, yet public officers are not liable for the misconduct or malfeasance of such persons as they are obliged to employ, the maxim respondent superior having no application to such officials. In other words, public officers, while liable to a civil action for willful or capricious omission of duty, resulting in injury to the party complaining, are not liable for mere neglect not personal. In the present case no personal neglect has been proved against any of the defendants.

'The negligence charged against the defendants," continues the judge, "consists, first, in allowing the bridge under their management to be overcrowded on the day the accident occurred. The evidence proves that there were 87,000 people upon it on the day of the accident, and that 183,000 had crossed it in safety on a previous day; that the arrangements were alike on both days. Second, in not appointing an adequate police force, as required by the act under which the defendants were appointed. The Superintendent, by and with the approval of the Chairman of the Committee on Organization appointed by the Board of Trustees, selected and appointed what they regarded as an adequate police force, which proved sufficient on all occasions prior to the one on which the plaintiff received her injuries. The evidence fails to show that the alleged irregularity of such appointment in any way contributed to the accident, or that it would have been avoided if double the force had been appointed. * * * The injury which the plaintiff received was caused by the surging crowd, and no personal act of the defendants has been shown to have been the proximate cause of it. The Trustees, acting individually, have no powers or functions. The Trustees are to meet and act as a board. To hold the Trustees of a public work under such circumstances personally and individually liable for acts such as the complaint charges would entail a dangerous responsibility that few would be willing to assume. * * * Under the circumstances, no personal, individual liability attaches to the Trustees for the acts imputed to them by the plaintiff, * * * and the complaint must be dismissed."

There are a great many suits against the Bridge Trustees based on the same ground as the Hannon suit. It has been agreed between James M. Lyddy, counsel for the plaintiffs, and Vanderpoel & Dyckman, counsel for the Trustees, that the other suits shall await the final disposition of the present one by the Court of Appeals.

MEXICAN RAILWAYS.

A brief item of news mentions the arrival at Kansas City from Mexico of a body of capitalists belonging to that country representing capital to the amount of sixty millions of dollars. The fact is interesting and important as showing the progress of Mexican enterprise in railway building; in enlisting the active sympathy and co-operation of the merchants, manufacturers, bankers, property-owners and mining interests of that Republic; in the movement for the development on a great scale of the commerce and producing forces of that country.

There appears to be a remarkable contrast between the American system of railway building and management in Mexico and the exorbitant exactions demanded and enforced by British and European capitalists engaged in railways, mining and banking in the same country. On the one hand, the terms offered by the Americans are peculiarly liberal and generous, but cover operations of immense magnitude, involving at the present time the building of railways, not only in all directions—north, south, east and west—but to all the leading commercial centers of the country, upon all the lines of internal traffic, and to the capital of every State and Territory in the Republic. It will thus be seen that the scope of this enterprise is so great as to bid fair to revolutionize the whole internal condition of the Mexican nation, to place it upon the high road of advanced civilization and rapidly progressive internal development. In plain terms the capitalists of Philadelphia, New York and Boston who have engaged in this enterprise propose to take up the Republic of Mexico and to give it an entirely new spirit, that shall render all the new railroads profitable to the American capitalists and be sources of new life and exhaustless prosperity to the Republic of Mexico.

The effect of this is expected to be very important to our own Southern and Southwestern States, in giving to their railroad system an ultimate point of trade and travel that ought to be susceptible of every extended development, and equal in fact to the corresponding value of the Pacific States and Territories to the commercial cities of the North and West. It should be understood clearly that there is no trickery about this enterprise, nor concealed arrangement for enabling the parties on the ground floor to make millions of dollars by sharp managment and very little labor. In fact the scheme is so vast in character that its success requires prodigious toil, a vast organization and an enormous outlay of capital, and our belief is that it will be as successful as our own Pacific railways have been.—*Philadelphia North American.*

THREE-WAY TUNNELS.

Mr. T. R. Crampton, who at the Southampton meeting of the British Association suggested a method of tunneling which, under certain conditions, seems of excellent promise, brought forward a suggestion at Southport for the construction of three-way tunnels. Now, the undoubted aim of all engineers is economy of construction and the securing of permanent advantages. Mr. Crampton maintains that the suggested system will give these, that three tunnels of, say, 17 ft. diameter, can be constructed cheaper than one of 30 ft. diameter. After describing Sir J. C. Hawkshaw's scheme for the ventilation of long tunnels the three-way scheme was discussed. Three separate tunnels of 17 ft. diameter each, or 227 ft. area, are to be connected by large passages about midway of their length. These passages are without valves; in fact, free air passages. Between these midway connections and the ends, say again midway between, is formed a branch at right angles either above or below with separate openings from the branch into the other tunnels, such openings being provided with doors or valves quite clear of the main tunnel, any two of which may be closed, thus separating at this point the corresponding tunnels from the third. The branch is to be led to any convenient position where the exhaustion apparatus can be placed. If two of the tunnels are left open to this branch, and the third one shut off from it by closing the doors, the vitiated air will be drawn from the two working tunnels, through the connecting branch, while fresh air will be partly sucked down the vertical shafts through their open ends and partly at the center tunnel, which is supplied by forcing air down the vertical shaft in communication with it, a stop or door being placed just outside of the bottom of the shaft so as to compel the air to flow to the center of the tunnel. It will be observed that no trains are running in this air tunnel so long as it is so used; there are similar doors for the working tunnel, but they are kept open, unless either of them is required to be made into an air tunnel, so that the passing trains run no risk of running into the doors. By means of the doors above mentioned, any one of the three tunnels can be used as a fresh-air tunnel, in which the men doing the repairs to the road would be clear of the traffic, while the other two are used for the traffic, as well as outlets for the mixed impure gas and air. If a breakdown of a train occurs in any one tunnel, that tunnel can at once be converted into a fresh-air one, while its traffic is transferred to the one previously used for air, thereby avoiding delay. The system described for splitting the air and drawing off the noxious gases is very similar to that described by Mr. Hawkshaw at Southampton. The valves and other details being added, to make the system applicable to three tunnels, it will be obvious that other modes of ventilation may be adopted. In order to reduce the number of men working in the tunnel it is proposed, if found practicable, not to adopt the ordinary ballast and cross sleepers, but to substitute the longitudinal timber system, the timbers to be secured to brickwork or concrete, forming a part of the tunnel lining, placing efficient elastic material between the foundation and longitudinals for their whole area, also between the rails and sleepers. An open drain is formed between the rails; by this plan any water accumulating flows over smooth surfaces through small channels into a drain, the tunnel on each side being dry. The saving of labor in repairs, if this system can be employed, is so evident that a large amount of money might be expended in endeavoring to discover a suitable elastic material for the purpose. There are data on many long viaducts sufficient to justify experiments being made on the subject, and it is not unreasonable to expect that suitable material may be met with. In very long tunnels nothing should be omitted tending to reduce the number of men working in them. The opinion was expressed that in tunnels passing through solid materials, and proper foundations being made for the longitudinals to rest upon, with good elastic material placed between the rails and sleepers and foundations, one-half of the men employed on the ordinary cross-sleeper road resting on ballast would be saved, more particularly as the repairs are effected in pure air free from the traffic as explained. The estimate as to the cost of this system was upon the dimensions given by Sir J. Hawkshaw, and the following gives the comparison:

The quantity of excavation and brick work or concrete in each case will be as follows: Single tunnel: 30 ft. diameter lining, 3 ft. thick, with the brickwork forming the air passage = to 36.5 cubic yards per yard forward. Excavation to outside of brickwork 36 ft. diameter = to 113 cubic yards per yard forward. Three tunnels 17 ft. diameter and 18 in. brickwork. Brickwork lining for three tunnels = 24.5 cubic yards per yard forward. Excavation outside brickwork for the same 105 cubic yards per yard forward. It is assumed that three 17 ft. tunnels are stronger, more conveniently formed, and involve less risks in construction than one of 30 ft. diameter; at the same time there is no difficulty in making the latter. The above shows the saving in the three tunnels of 23 per cent. in brickwork, and about 7 per cent. of earthwork, compared with one of 30 ft. With regard to ventilation, it is well known that the power required to force air along passages is practically as the cube of the velocity: and as the area of the air passages in the single tunnel is 106 ft. with speed ten miles per hour, and that of one of the 17 ft. diameter is 227 ft., or rather more than double, giving only five miles per hour velocity, it follows that the power for this portion would be eight times less. That for the working tunnels would be practically the same, the velocities being nearly alike in both cases, which would be about 2½ miles per hour—the 30 ft. having an area of 470 ft., the two single ones together about 450 ft. Upon the face of it the system deserves a trial. A full consideration of the scheme by engineers preparing plans for new tunnels would no doubt throw further light upon the subject, and be of interest wherever such work is contemplated.—*Contract Journal.*

BRIDGE NOTES.—Iron for the new deck or through spans of the St. Charles bridge, to supplant the Fink spans now in use, is being received daily, and there are at present over 100 men engaged making preparations to raise the superstructure. When this will have been completed there will not be a single piece of old iron left from one end to the other of the bridge, which, including the trestle, is over a mile long.

The bridge over Stony Brook Glen, four miles south of Dansville, N. Y., on the new line of the Lackawanna & Pittsburgh, from Belfast to Perkinsville, will be one of the highest in the country. It will be 700 ft. long and 236 ft. high from the surface of the brook to the rails. The scenery of the glen is said to be very grand, rivaling the famous Watkins Glen.

One of the abutments of the bridge of the Pennsylvania Schuylkill Valley Railroad, which is to span the Schuylkill River at Phœnixville, will be 52 ft. high. The other abutment and pier will be 31½ ft. high. One of the spans which have to cross the Philadelphia & Reading Railroad and canal will be 237 ft. long.

The steel bridge to be built across the South Saskatchewan, at Medicine Hat, Manitoba, this coming winter, will be 900 ft. long and 36 ft. above low-water mark. It is to rest on six piers and two abutments, and is to contain a swing between the first and third piers. About fifty men are at present employed, but this force is to be increased to upward of two hundred. One thousand car-loads of stone will be required for the piers. Mr. Thos. Watts is superintendent for the contractor, Major Bowles, of Winnipeg, while J. H. Armstrong performs a similar duty for the N. A. C. Co. The cost will not be far short of $250,000.

ILLINOIS GOVERNMENT BUILDINGS.—The report of the Supervising Architect has the following as to buildings in course of erection: Quincy (Ill.) Court House and Post-Office—The site for this building has been selected, and the title approved May 22, 1883. The plans have been prepared and excavation commenced. Peoria (Ill.) Post-Office and Court-House—Since the approval of the title to the site of this building the excavation has been completed and the concrete foundations are now being laid. Cairo (Ill.) Marine Hospital—The site has been selected and the title secured.

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PROBLEM IN SURVEYING.—8 A, 1 R, 33 P, is the answer to problem in surveying, given Oct. 13, by C. E. Pitkin, Colorado, as solved by "I. A. G. W.," While Hall, Ky., who will probably send a copy of the figures in detail to "C. E." if desired.

MINNEAPOLIS SEWERAGE.

City Engineer Rinker read a paper Nov. 9 before the Engineers' Club of the Northwest, upon the sewerage of Minneapolis. From a short abstract of this paper we learn that the city mentioned has now about 5½ miles of sewer in use; three of these were built last year, and it is expected that fully six miles more will be added to the system before the expiration of the present year.

Engineer Rinker strongly recommends the construction of a tunnel through which to discharge the sewage of North Minneapolis—at a cost of about $100,000—as the only means of abating the danger to which that section of the city is now exposed.

THE INSTITUTION OF CIVIL ENGINEERS.

The latest excerpt Minutes of the Proceedings of the Society are as follows: "The Water-works of Edinburgh," by Alex. Leslie; "The Water-works of Port Elizabeth S. A.," by John George Gamble; "The Water-works of Peterborough," by John Addy; "Water Supply and Irrigation of the Canterbury Plains, N. Z., by Geo. Fred. Ritso; "A Deep Boring at Northampton," by Henry John Eunson; "The Treatment of Complex Ores and Condensation of Lead Fumes," by Jas. Warne Chenhall; "Blasting a Channel in the Yarra River and Melbourne, Victoria," By Joseph Brady; "Continuous Girder bridges," by Thomas Claxton Fidler; "Graphic Method of Computing Stresses in Jointed Structures," by Chas. Ormsby Burge; "Raising the S. S. Austral," by John Stanfield; "The Preservation of Iron by one of its own Oxides," by Ben. Howarth Thwaite.

LAYING A WATER MAIN ACROSS THE EAST RIVER.

Probably the longest water main ever laid on the bed of any river in this country was sunk in the East River on Nov. 21. The pipe is 4 inches in diameter and 2,200 feet long, and is described as being "threaded" at the joints, with an iron sleeve 1¼ in. thick, and each joint calked solid with 50 lbs. of lead. A wooden box, made of 2½-in. white oak planks, encased the pipe, the space about the pipe was filled up with cement, and the sections of the box tied together by 31,000 lbs. of iron bolts. The total weight was 350 tons, the pipe being jointed and the box finished in all respects on shore.

To get this box into the water 125 rollers were first placed under it, and then, with the assistance of four steam tugs and the powerful engines of a dredging boat, the whole mass was dragged across the stream. The friction of the chain on the dredge nearly severed a ten-inch post covered with half-inch iron, and set fire to the dock.

The contractors for the work were John McQuade, who is now building the Madison Avenue Bridge over the Harlem River, and Wm. F. Croft. The contract price was $32,000.

This pipe crosses from One Hundred and Thirty-eighth street, New York, to North Brother Island, in the Sound; the channel varies in depth from 28 to 150 feet.

THE FRENCH SOCIETY OF CIVIL ENGINEERS.

At the meeting held in Paris, Oct. 6, the President, according to usage, gave a summary of the principal engineering events of the year, and referred also to the trip made by a number of the members to Belgium and Holland and to the Amsterdam Expositions. Among other points visited he mentioned the excursion to the dam near Liege across the valley of the Gileppe, which stores about 17,000,000 cubic yards of water intended for industrial purposes at Verviers; this dam is 156½ ft. high; is 213.2 ft. thick at the bottom; it is 269 ft. long at the base, and 721.6 ft. long at the top. It is intended to raise this dam 16.4 ft., so that the storage may be increased to 24,000,000 cubic yards (4,460,000 gallons).

M. Malo read a paper upon Asphalt Masonry. He thought its use was not sufficiently appreciated; it is not in danger of being softened by heat when the mass is more than about 4 in. thick; and mixed with pebbles could be used as a kind of beton in foundations; and if poured into molds would rigorously retain its form. The solidity of this material is extreme, and the duration indefinite; to demolish it powder is necessary. M. Malo believed that it was destined to be of signal service in the constructive arts, owing to its precious qualities of tenacity and elasticity, and extreme anti-absorbent qualities. In referring to the cost of such masonry he remarked that it necessarily varied with the conditions, but, considering the results obtained, cost was a secondary object.

STANDARD SIGNALS FOR ALL RAILWAYS.

Now that the principal railways of this country have adopted a standard time for the running of their trains, it is most certainly in order to advance a step further and reduce to a standard the various conflicting systems of railway signals. In locomotive whistle signals alone there are said to be forty different systems in use, and an engineer trained on one trunk road is valueless for a time on any other. The conductor's hand and lantern signals, the bell-cord, torpedo and roadside signals make no pretence to uniformity.

Action has been already taken to the extent of appointing a committee of expert railroad men to investigate this matter and recommend such a standard signal system as their wide experience might suggest. Mr. James McCrea, manager of the Chicago, St. Louis & Pittsburgh Railroad, is chairman, and as such has just presented the result of the Committee's labors.

For hand and lantern signals they recommend the following for all railroads:

Go Ahead—A motion up and down.

Stop—A motion crosswise with the track.

Back Up—A motion in a vertical circle.

Train Parted—A motion in a vertical circle at arm's length across the track, given continuously until answered by the engineer.

The Committee will recommend the following bell-cord signals: One bell to start, train standing; two bells to stop, train running; two to call in flagman, train standing; three to stop at next station, train running; three to back, train standing; four to reduce speed while running. For whistle signals eleven are recommended. These are the principal ones: Long blast for approaching stations, crossings and junctions; short toot for apply brakes; two blasts for "off brakes"; two toots as an answer to any signal; three blasts for train parted, and three toots for back up.

Under the heading of stationary and fixed signals their recommendations are very thorough. For torpedo signals they recommend one torpedo for danger and two for caution, the latter, so that if one misses fire the other will bring the train to a stop.

The report of the Committee will be received by the next Convention, and, it is believed, will be accepted, with very slight modifications, if it is not adopted outright. Unlike the time standard, this will affect none but the railroad men, yet it will be of great convenience to them.

THE WATER-WORKS OF WINDSOR, NOVA SCOTIA.

The town of Windsor was incorporated in 1876; the natural water supply is very bad, owing to the large deposits of gypsum rock in the neighborhood, and the imperfect drainage of the town itself.

After considerable opposition and delay, Mr. E. H. Keating, M. I. C. E., City Engineer of Halifax, was engaged, in 1882, to examine into and prepare plans for a water supply, and the work completed Nov. 17 has been carried out upon his plans and estimates at a cost of $50,000.

A reservoir 18 ft. deep and covering three acres in area has been formed by damming a brook some distance from the town; the surface of water in the reservoir being 186 ft. above the main street. There are four miles of 10-in. pipe leading from the reservoir, and three and a half miles of distribution mains.

The following are the rates charged to consumers as per assessed value of real estate (upon which any building is erected) and personal property:

Quantity.	Per annum.
100 to 500 gallons	$3
500 to 700 "	4
700 to 1,000 "	5
1,000 to 2,000 "	6
2,000 to 4,000 "	7
4,000 to 6,000 "	8
6,000 and upward	9
Water closets, each	4
Horses (carriage)	2
Horses (trucking)	1
Hotels from	$10 to 20
Large boarding houses	7
Small boarding houses	5
Public baths	4
Workshops	2
Saloons	1 to 5
Fountain taps	5

Manufacturers and other large consumers by agreement—5,000 gallons and over at a rate of five cents per 100 gallons. A portion of the piping was supplied by W. S. Symonds &Co., the valves by Alex. Moir & Sons, and service stop-cocks by Macdonald & Co., of Halifax; andthe hydrants and special castings by the Windsor Foundry Company.

THE PANAMA CANAL.

According to the *Bulletin du Canal Interoceanique* the condition of the work on the Panama Canal was as follows on Oct. 1:

Colon.—The amount of material moved at Monkey Hill during the month of September was about 21,000 cu. yds.; most of this was dumped along the Panama Railroad and has also been used in filling up the terre-plein in that neighborhood. The railroad from wharf No. 5 has been connected with that of the Canal Company. All the crossings have been finished at the entrance to the terre-plein, and also the principal saw-mill with its shed. Three new wharves have been finished, one for the unloading of personal and light material, the other two, at the terre-plein, for the discharge of the ballast from the quarry at Kenny's Bluff. The lighters have carried to the site of the canal entrance, during the month, 2235 tons of stone. The dredging before wharf No. 10 is finished.

Notwithstanding the sending of dredge No. 1 to Gatun for repairs, the dredges here have excavated about 45,607 cu. yds. In this quantity is included the work of the marine dredge, which has been employed exclusively upon the coral.

Gatun.—Dredge No. 3 has taken out 8,000 cu. yds. at the entrance to the Rio Gatuncillo. Dredge No. 4 is ready to commence work at Rio Trinidad.

Buhio-Saldado.—The grading has been finished for a road leading from the permanent camp to the bed of the canal proper, on the right bank of the Chagres, and the bridge piers are commenced over which the road must pass. The new camp progresses rapidly; two large houses are built, and one is already occupied by the offices of this section. Upon the left bank a large store-house is finished.

Tabernilla.—In this section has been constructed during the month a wharf, a stable for 10 horses, and a forge; 15 shanties have been fitted up for 240 workmen. About 2600 cu. yds. of grading were done.

San Pablo.—The road leading to the canal ha

been finished, the material being handled by a locomotive and 12 wagons. The railroads leading to the new camp are finished. About 8,000 ft. of track has been laid. The clearing and surveys are completed between Kil. 36,040 and 37,400.

Gorgona.—The grading is completed for the road leading from the Panama R. R. to the axis of the canal. In this section the contractors are daily adding to their force and plant. Between Kilometers 41 and 42, 8,000 cu. yds. have been removed by an excavator. In the Matachin section, between Kilometers 43 and 45, four excavators are at work. The site for the central workshop between the Panama R. R. and Chagres, near Gorgona, is entirely cleared of timber.

Gamboa.—The workmen on the Upper Chagres continue their clearing on the right and left bank of the river.

Obispo.—Several new workings have been commenced between Kilometers 45 and 46,47 and 49. A road has also been started, leading from the depot at Bas-Obispo to the Gamboa dam, along the banks of the Obispo and the Chagres. The Bona contract, extending from Kilometer 45 to 45,850, has delivered 8,923 cu. yds. of material during the month, and the Muraccioli contract about 32,400 cu. yds.

Emperador.—In this section the two excavators have given 44,900 cu. yds.

Culebra.—Two excavators are at work on grade 95 with four locomotives; they have handled 5,866 cu. yds. On Sept. 15 work was commenced on the transportation of ballast into this section from the banks of the Chagres at Matachin.

Rio Grande Supérieur.—Preparatory work is being pushed with vigor. During the month 35½ *hectares* were cleared of timber. The work of changing the course of the Rio Grande has been commenced. A reservoir in masonry has been constructed to catch the water from the source of the Cerro Culebra; with the proper conduits and two other reservoirs also finished, the water supply of the two encampments here is assured.

Paraiso.—One excavator has taken out in this section 2,600 cu. yds., of which 1,866 yds. were rock. A second excavator is about being put to work.

Panama.—Work is being continued on improving and macadamizing the road leading to the Central Hospital, and also the roads leading to the different buildings. Below the Corosal the surveys and levels upon the canal line are almost finished; there remains about one kilometer yet to do at Boca, and some surveys to be verified between Kilometers 62 and 64. A clearing, extending 1,000 ft. on each side of the center line, has been commenced at Boca.

THE BOWER-BARFF PROCESS—THE PRESERVATION OF IRON BY ONE OF ITS OWN OXIDES.

The following matter relating to this important and interesting subject is abstracted from a paper by Benjamin Howarth Thwaite, recently read before the Institution of Civil Engineers.

When iron is exposed to contact with ordinary moist atmospheric air, it unites with the oxygen in the latter, to form two varieties of oxide of iron; first, the ferreous oxide (FeO), which becomes rapidly converted into the second variety, the ferric oxide (Fe_2O_3). If this iron is exposed to this oxidizing influence long enough, the superficial film of oxide on the surface is converted into the second variety or ferric oxide, and part of its oxygen is again transmitted to the metallic surface beneath to form ferreous oxide, and this latter in turn becomes ferric oxide; the process thus repeating itself until the entire mass of iron is oxidized. From the experiments of the author, a bar of wrought-iron 4 in. by 1 in. subjected to the corrosive influence of a manufacturing city has a lifetime of a single more than a century.

Fortunately there is a third combination of iron with oxygen, or the magnetic oxide (Fe_3O_4) which is most stable, and once formed of sufficient thinkness, arrests further oxidation of the iron. It is found in a natural state on the shores of New Zealand, in the form of black titaniferous sand. Lavoiser is credited with the discovery of the artificial formation and its stable properties. It was also discovered by the late Robert Mallet; Berthier noticed it, and Thirault is said to have produced the magnetic oxide in 1860. A modification of Thirault's process is now used by gun-makers, but it is a long and tedious operation.

Russian sheet-iron is covered with a thin and rather pliable film of this magnetic oxide, whether originally applied by accident or design, it is now impossible to say. Some years ago Prof. Barff, F. C. S., while experimenting in peat-charring, noticed the formation of this peculiar oxide in a pipe conveying highly-heated steam. He at once commenced experiments with the results known. In his specifications Prof. Barff describes his process as follows:

"I place the objects of iron or steel in a muffle or chamber, so constructed that it may be in part wholly closed, and so that the contents of the interior of such muffle may be raised, by means of external heat, to an elevated temperature, and when the objects have acquired a temperature sufficiently elevated to cause the decomposition of steam or aqueous vapor, when brought into contact therewith, I inject the same, and continue the action of the steam, etc., until the desired protective coating or film of oxide has been produced."

The muffle used by Prof. Barff is a brick chamber about 6 ft. long, beneath which is fixed an ordinary fire-grate. The heat from this fire passes both under and around the brick chamber and thence to the chimney. Alongside the chamber is placed the steam generator, which is practically a vertical boiler. Beneath this generator and directly over its individual fire grate is placed a coiled steam-superheater, from which the steam issues direct into the brick chamber or muffle. The hydrogen, the result of the decomposition of the steam, is lead by another pipe from the top of the muffle to the underside of the fire grate under the steam generator, where it is consumed.

On hearing of Prof. Barff's process it occurred to Mr. Geo. Bower that highly heated air might possibly be used with success in obtaining the magnetic oxide. After elaborate experiments conducted by Mr. Bower and his son, the required oxide was obtained by blowing ordinary atmospheric air into an externally heated chamber, but the process was difficult and expensive. Further experiments were more successful. In the latest furnace used there are three producers of gases, ranged in a line, to insure a plenum of supply (they are each somewhat similar to an ordinary single Siemens producer with inclined plates). Coals are charged into these furnaces through specially devised plug-hoppers. The gases pass over the partition walls at the end of and between the three producers, and descend by a down-cast in which is fixed a regulating valve. The gases then pass along a horizontal end flue to the mouth of the combustion chamber, which lies in a line parallel to and alongside the producers. At the entrance to this last chamber the gases meet a current of heated air ascending from an intake port. Combustion here ensues, perfect mixing and oxidation of the gases being secured by a series of intercepting chequer walls in the combustion chamber. The products of combustion then pass into a side flue and thence ascend into the muffle, where the objects to be coated are placed. After performing their duty there these gases first pass around the fire clay tubes which conduct the air to the mouth of the combustion chamber, and after heating the air contained in them it escapes by the chimney.

The cast-iron objects to be treated are placed in the chambers and gradually heated by the combustion of the gases from the producers to a temperature of about 1,600° F. The oxidizing process is then commenced by allowing highly heated air in excess of that needed for combustion to enter the furnace. The oxygen in the air in excess enters into a double combination with the iron. On the immediate surface of the iron a film of the magnetic oxide (Fe_3O_4) is formed, and over this a film of sesquioxide (Fe_2O_3). The process generally occupies about twenty minutes. The air-valve is then entirely closed, and the combustible gases from the producers (carbonmonoxide, etc.) are allowed to enter unconsumed into the muffle. By this operation, a deoxiding one, the sesquioxide is converted into magnetic oxide. This second process occupies from fifteen to twenty-five minutes; the duration depending entirely upon the quality of coal-gas used; the richer this is in carbon the less time required. The air-valve is now opened and another double combination of oxygen and iron is effected, and by repeating this operation of alternate oxidation and deoxidation as described, sufficiently often, the entire metal can be oxidized.

Only six double periods of oxidizing and deoxidizing are necessary to sufficiently coat articles intended for indoor use; ten to twelve double periods are required for such as are subjected to external atmospheric influences. Owing to the great sensitiveness of wrought malleable iron and steel to oxidizable influences, the Bower process produces the coating of oxide in these varieties too rapidly, and it is not sufficiently uniform or adherent; the Barff process is found more satisfactory for these last. For this reason the inventors have combined their processes, and in the latest furnaces have so arranged them that either highly-heated air or super-heated steam can be used at will. In these the waste products of combustion, before escaping into the chimney, pass through a vertical multi-tubular boiler (a Cochrane's patent), and there make the steam.

Oil is sometimes used in the deoxidizing process with good results. The oil is passed into the muffle by a funnel having a siphon bend, and terminating in a ½ in. gas pipe.

In using steam a continuous and uniform pressure must be maintained. The least admission of air will produce an imperfect and unstable coating of oxide. This last effect is shown by an oxide of a brilliant red color having a lustrous appearance. This color is an evidence that the muffle leaks. In the Bower process the rustier the articles are the more effective and speedy is the process of oxidation. Old cast-iron water and gas pipes, so covered with rust as to be commercially valueless, have been converted into a condition more durable and valuable than when first drawn from the molder's sand.

The magnetic oxide coating is smooth to the touch and has a light tint of French gray, which can be changed to a silvery, lustrous appearance by filling the muffle with the vapors of volatilized liquid hydro-carbon, produced from oil as mentioned. The least touch of liquid grease, oil or other hydro-carbons converts the light French gray color into a bluish black, which no energy of washing or rubbing will remove; but this grease can be volatilized by heat and the original color restored. All articles that are to be handled should be oiled. Mineral oil is the best.

It was noticed by Mr. Bower that if any foreign metal was rubbed upon an oxidized surface, part of this metal remained there. This led to experiments with a series of metallic brushes with wires of the noble metals and different alloys, and in all cases the results were the same. Oxidized castings can be cheaply and quickly gilded, platinized or bronzed, etc., by simply rubbing them with brushes made of these metals, and then, to fix the coating, subjected the object to a temperature of about 600° F. for about 30 minutes.

Sir Joseph Whitworth has made a series of tests and finds that the strength of structural iron work is practically unaltered by the Bower-Barff process. The magnetic oxide is not pliable, and hence is not suited for articles which have to be bent after treatment; and, if struck very violently by another hard metallic body, is liable to chip at the point of contact; the corrosion following such exposure is purely local. The thickness required for different purposes is shown in the following table:

Light sheet iron	0.0035 in.
Light wrought iron	0.0104 "
Heavy wrought iron, such as tubes	0.0188 "
Light cast iron	0.0183 "
Heavy cast iron	0.0200 "

THE INDUSTRIAL SITUATION.

Our private advices from nearly all leading manufacturing centers of the country, while recognizing the depression of the manufacturing industries as serious and likely to be prolonged, do not justify all the gloomy apprehensions indulged in, and predictions made as to the course of trade and prices for the next six or eight months. At a time like this, when orders are falling off and consumers frightened, it is natural to fear the worst, and to say more than circumstances warrant. Our manufacturers have become so used to prosperity, high prices and abundant business that they are not as well prepared to encounter depressions in trade as are foreign manufacturers, who are treated only at long intervals to anything liked the prosperity which is so common on this side of the Atlantic. Unless all mills are rushed with orders, and every wheel turning, business is declared to be dull, and the outlooks for trade gloomy.

The fact of the matter is that, when all the statements made are carefully sifted, there is a fair consumption going on: enterprise is at work; capital is active and confident, and labor is profitably engaged throughout the country. The great mistake made has been that capital has been driven too rapidly into certain channels, especially iron and steel making. This statement can be demonstrated by reference to figures in all branches of industry. For instance, in the nail trade: in 1880 the production was 5,370,512 kegs, and in 1882 6,147,097 kegs, an increase in two years of 776,585 kegs, an increase of less than 15 per cent. At this rate of increase the production for 1884 should be but little in excess of 7,000,000 kegs. By reference to the statistics of the Iron and Steel Association we find that the actual producing capacity next year will be in the neighborhood of 12½ million kegs. The question therefore arises, What will become of the surplus? It would require an extraordinary boom in building to create a market for an additional 5 million kegs, for which there is capacity. The Western nail makers, recognizing the difficulties in the way, have ordered a five weeks' suspension, beginning December 22nd. But this restriction will not cure the evil. Too much has been put into the nail business. There is too much iron and steel being made. Even with four mills out there is far more steel rail capacity than can be employed. Last year the consumption of steel rails fell but little under 2,000,000 tons. This year the total consumption will be less than half that amount. The same trouble affects the blast furnace interests. Since the opening of the year eighty-six furnaces have gone out of blast. Since July 1st eight anthracite furnaces have blown out, but fifteen butuminous furnaces have blown in. Since July 1st stocks at furnace banks have been reduced 96,236 tons. A better feeling pervades the pig iron trade in consequence of this restriction of production, and decrease in stocks. Demand is improving slowly in Eastern Pennsylvania, and in some sections of the West mill-owners are buying more freely, though still holding back on account of the downward tendency in the finished product. Stocks of pig iron are low in consumer's hands, and hence some anxiety is exhibited to cover emergency requirements at the present low rates, which are at cost in many cases. Pennsylvania holds the lead, with 275 furnaces, but on Nov. 1st only 149 of these were in blast: 15 charcoal, 45 bituminous and 89 anthracite.

During the past thirty days bridge, car and ship builders and locomotive makers have purchased large quantities of material at very low prices—probably as low as iron will go during the present depression. Consumers recognize the fact that any attempt to depress prices below the present limits results in suspension. Between 12 and 15 thousand tons of iron for engineering purposes will be called for before the end of the year. Orders for 3,000 cars have been given out, and others will follow during the winter. A large amount of pipe work has been contracted for to meet requirements for oil, natural gas, and steam purposes. The activity in establishments turning out motive power is one of the most favorable features in the situation.

Reports of railway earnings show an improvement on 52,000 miles of road of 1 per cent. per mile for October. Northwestern and Southwestern roads show a gain of about 9 per cent.; roads north of the Ohio and Potomac show a satisfactory improvement. Thirty-four of our principal roads show, for the first week in November, an increase from $4,575,475 last year, to $4,978,915 this year.

Shipments of through freight eastward from Chicago for October foot up 195,344 tons, against 152,871 tons for October last year, the largest of any shipments for five years, excepting the phenomenal year of 1881.

The general statements made above can be verified by references of this character.

OBITUARY.

DR. CHARLES WILLIAM SIEMENS.

The cable announces the death in London, on the 20th, of Dr. Charles William Siemens, the well-known scientist, engineer and electrician, of rupture of the heart. The cause of the trouble was a fall ten days ago in Park Lane. Dr. Siemens was born at Lenthe, Hanover, April 4, 1823, and belonged to a distinguished family of scientists. He was educated at the Gymnasium of Lubeck, the art school of Magdeburg, and the University of Göttingen.

He entered Count Stolberg's engine works as a pupil in 1842, and in 1843 and 1844 visited England to introduce and patent a gilding and silvering method of his brother Werner's and a differential governor for steam engines invented by him and his brother. In 1844 he brought out anasthetic printing, and the invention of his double air cylinder and chronometric governor followed. In 1847 he turned his attention to the study of the dynamical theory of heat, and also to the use of a regenerator for recovering that portion of the heat which presents itself at the exhaust part of a caloric engine. An engine constructed on this principle was found satisfactory at the Paris Exposition of 1857. In 1851 Dr. Siemens invented his largely used water meter, and between 1856 and 1861, in conjunction with his brother Frederick, completed the regenerative gas furnace, a great achievement. The steel process worked by these furnaces has gained the two brothers great renown. The steel is used in building steel ships and boilers. In 1867 Dr. Siemens sent to the Paris Exposition samples of steel made directly from ore by his then newly invented rotary furnaces. In 1868 he originated the Landore Siemens Steel-works, which manufacture upward of 1,000 tons of cast steel per week.

From 1848 Dr. Siemens took deep interest in telegraph engineering, and in 1858, with his brothers Carl and Werner and Mr Holske, of Berlin, he established in London extensive telegraph works, from which lines have been shipped to all quarters of the globe. These works constructed the Indo-European, North China, Direct United States and Platino-Brazileira cables, as well as others. Dr. Siemens' most important telegraphic enterprise was that for which the steamer Faraday was built. The Direct United States cable, in which the Siemens brothers were so actively employed, was a great step in telegraph engineering. Since 1844 Dr. Siemens resided in England. He was elected a fellow of the Royal Society in 1862; member of Council of Institution of Civil Engineers and of the British Association; a Manager and Vice-President of the Royal Institution, and was once President of the Institution of Mechanical Engineers. He was first President of the Society of Telegraph Engineers. In February, 1877, after having visited this country, he was made an honorary member of the American Philosophical Society, and in October, of the same year, became an honorary member of the Gewerbe-Verein, of Berlin. He was a member of the Athenæum Club and of the Philosophical and Royal Society Clubs. In 1869 Oxford University conferred upon him the degree of Doctor of Laws, and in 1874 he received the Royal Albert medal for his researches in heat and his metallurgical processes. In 1875, he received the Bessemer medal of the Iron and Steel Institute for his services to the iron and steel trades.

PERSONAL.

MR. V. E. GREGG, formerly draughtsman for the Louisville, Evansville & St. Louis, is giving instruction in mechanical drawing in Cleveland.

MAJOR M. B. ADAMS, of the government engineers, who has had charge of work at Erie, Pa., and vicinity, has been sent to Little Rock to superintend the improvement of rivers in Kansas.

MAJOR S. WHINERY and CAPT. G. B. NICHOLSON the division engineers of the New Orleans & Northeastern road, returned from a tour of inspection, and declare themselves satisfied with the work.

J. W. ROBBINS, Surveyor-General of Arizona, died at Tuscon, in that State, on Nov. 14. He had been suffering from consumption for some months. Deceased was formerly connected with the Chicago *Inter-Ocean*. He was a popular official.

Mr. THOS. DEAN, of Indianapolis, Ind., was lately in Clinton, Iowa. Mr. DEAN is of the firm of DEAN BROS., manufacturers of steam pumps and water-works machinery, and went there to put in an addition to the compound engine at the water-works.

T. F. OAKES, Vice-President of the Northern Pacific R. R., has announced, by Circular No 71, that for the present he will, in addition to his regular duties as Vice-President, also assume those of the General Manager, vice General HERMAN HAUPT, resigned.

HERMAN HAUPT, late General Manager of the North Pacific R. R., resigned his position on Oct. 20. He gives as a reason for so doing the instruction received by him from the company, whereby he is required to curtail expenses in every department, to discontinue work in progress, and discharge employés who have served the company efficiently. General HAUPT says that the restrictions placed upon him are such that he cannot possibly continue in the management and secure results either creditable to himself or satisfactory to the stockholders.

DAVID LOWBER SMITH, appointed by the Commissioner of Public Works as Water Purveyer in place of DANIEL O'REILLY, recently appointed Police Justice, was graduated from the College of the City of New York, in 1866, and almost immediately went abroad, where he devoted three years to the study of civil and mining engineering. Shortly after his return from Europe he entered the Department of City Works, in Brooklyn, and was engaged upon different engineering works for that city until 1878, when he was appointed Assistant Engineer in the Department of Public Works of this city by Commissioner ALLAN CAMPBELL. He was the engineer in charge of the extensive works at Williamsbridge on the Bronx River supply.

CORRESPONDENCE.

THE ORIGINATOR OF THE NEW STANDARD TIME.

EDITOR OF ENGINEERING NEWS:

In the personal column of your issue for Nov. 10th, 1883, you state that "Mr. William F. Allen, of Bordentown, N. J., is the originator of the new standard time."

In this I think you are in error. I do not know exactly when the new time system was first advocated by Mr. Allen, but I am quite sure that it was not until it had been taken in hand by others, and particularly by the American Society of Civil Engineers.

In June, 1881, Mr. Sandford Fleming, the first Chief Engineer of the Canadian Pacific Railway, read before the convention of this society at Montreal, a paper on standard time, in which the system lately adopted by the railways was fully described and its adoption strongly urged. Mr

Fleming also stated that this matter of standard time had been already considered by the American Meteorological Society, New York, the Imperial Academy of Science, St. Petersburg, the Royal Society, London, England, the Canadian Institute of Toronto, and other scientific societies, and that the first and the last named of these societies had passed resolutions urging the adoption of the system set forth by Mr. Fleming not only throughout the United States but throughout the globe.

In furtherance of this object a special committee of the society, composed of Sandford Fleming, chairman, Charles Paine, A. J. Cassatt, J. M. Toucey, J. E. Hilgard, T. Egleston and T. G. Ellis, was then appointed, which committee has been continued and has been actively at work from that time until the present. Early in the year 1882, a pamphlet setting forth the proposed new system in detail, accompanied by a series of questions designed to elicit all shades of opinion in regard to it, was prepared by them and circulated broadcast over the whole country, being sent especially to railway managers.

In the movement thus organized Mr. Allen heartily joined, and as editor of the *Official Railway Guide*, and secretary of various time conventions, has done very much to hasten definite action by the railroads, but he was not the "originator" of the system in any sense.

Just who the originator really was, it may, perhaps, be impossible to discover; but, so far as I know, the first to propose it in this country was Mr. Charles F. Dowd, who was at the time principal of a seminary for young ladies at Saratoga, New York. In 1870 Mr. Dowd published a pamphlet of over a hundred pages, entitled "System of National Time for Railroads." The system which he proposed was identical with the one just adopted, except that he took as his initial meridian that of Washington and not that of Greenwich. His exposition of the system was followed by tables of "all the railways in the United States and Canada," in which are given the names of the stations and the difference between local and standard time for each one. To this pamphlet is prefixed a testimonial, signed by J. Tillinghast, Gen. Sup't N. Y. Central R. R., J. V. Baker, Gen. Sup't Rensselear & Saratoga R. R., J. M. Toucey, Sup't Hudson River R. R., and C. O. Russell, Sup't Boston & Albany R. R., in which they indorse "Mr. Dowd's plan of systematizing railway time" as "simple and practicable, and worthy the attention of railway managers."

Unless, therefore, some one can point out an earlier statement of the system than this one, the honor of being the first to publish and advocate it must rest not with the editor of the *Official Railway Guide*, nor yet with the American Society of Civil Engineers, but with the principal of "Temple Grove Ladies' Seminary."

Respectfully yours,

ROBERT MOORE.

ST. LOUIS, Mo., Nov. 19, 1883.

CHARCOAL BURNING APPARATUS.

CHARLOTTESVILLE, Albemarle County, Va., Nov. 22, 1883.

EDITOR ENGINEERING NEWS:

Can you tell me where I can buy or get information of the most improved and most economical apparatus for charcoal burning—iron retorts, etc. I have more wood here than I want, and propose to convert some of it into charcoal, if it can be done at a profit. I will be obliged for any manufacturers' circulars relating to the case in question. Address, Box 68, P O., Charlottesville, Albemarle County, Va.

EXPLOSION OF POWDER HOUSES.

RICHMOND, Va., Nov. 17, 1883.

EDITOR ENGINEERING NEWS:

Can you readily refer me to instances where powder houses have exploded and what was the effect upon buildings in the immediate vicinity? As there have been many newspaper accounts that are more or less inaccurate I would prefer to direct attention only to those that have had a scientific investigation. Yours very truly,

DYNAMITE.

ELEVATION OF OUTER RAIL.

CHIEF ENGINEERS' OFFICE, PARKDALE, Nov. 15, 1883.

EDITOR ENGINEERING NEWS:

It has been the custom with some engineers, in elevating outer rail for curvature, to divide the elevation required between the two rails, elevating the outer and depressing the inner one, carrying the center of track at grade. This would give a "down grade" on one and an "up grade" on the other rail.

This is certainly contrary to "old time" practice, and upon what theory it is based I am unable to determine. Would like to hear from some of your readers on the subject. Also, what formula is generally used for finding additional width of gauge on curves.

Truly, &c.,

A SUBSCRIBER.

THE FREEZING OF TUNNELS.

NORTHERN PACIFIC RAILROAD, ENGINEER'S OFFICE, HELENA, M. T., Nov. 8, 1883.

EDITOR ENGINEERING NEWS:

In devising means to keep Mullan Tunnel from freezing the opinions of several experienced men were asked. Incidentally, a man of much experience in tunnels asserted that in a tunnel 2,200 ft. long, with a fall of 2 ft. to the hundred, a height of 20 ft. and width of 16 ft., an air-tight bulkhead at the center of its length would prevent freezing at *both* sides of the bulkhead, even if the temperature remained 30° Fahr. below zero outside of the tunnel for a month.

The claim seems to me so absurd that I would like your opinion, or that of some of your experienced readers, as to how much of the tunnel the bulkhead in the center would preserve from freezing under the conditions named.

Yours truly,

FRANCIS C. TUCKER.

LIVERPOOL ENGINEERING SOCIETY.

The thirteenth meeting of the session was held on Wednesday, the 7th of November, at the Royal Institution, Colquitt street, Mr. H. Bramall, president, in the chair, when a paper entitled "The Proposed Lancashire Plateway" was read by Mr. A. Holt, M.S.C.E. The author commenced by stating that while the project was at present in embryo it would be impossible to avoid mixing commercial matter with engineering, as the latter was dependent on the requirements of the former. "Necessity was the mother of invention," and the pressing personal necessity of cheaper conveyance drove him to devise this scheme in order to obtain something approaching natural carriage rates for export goods to China. He did not think equal mileage rates were possible, but that the heavy disabilities from which Lancashire suffered were indefensible on any other ground than that the carriers were able to enforce them. The course of thought that led him to suggest the plateway system, for which he claimed no invention, but only adaptation, was as follows: Analysis of the present carriers' rates soon showed that nearly half the whole were for other services than carriage, and which were not asked for by the traders, broadly known by the name "terminals" and mainly consisting of loading and discharging and station expenses. This led him to endeavor to devise a system which would avoid these. This was evidently attained by the plateway, the underlying principle of which is that the same vehicle would be suitable for being drawn on ordinary roads or along metals. Thus all loading and discharging were avoided and the stations were reduced to mere open yards for coupling lorries into trains. The steam traction when on the metal would be done by ordinary locomotives arranged with small wheels for slow draught, say ten miles an hour. Another leading distinctive feature of the plateway is that though the speed would be slow the delivery would be quick, owing to no delay being necessary to keep the line free for passenger trains, the conveyance of goods alone being contemplated. There is, Mr. Holt alleged, no constructive difficulty in drawing a wagon on metals; its strength and durability is more severely tested at present on the rough roads. The metals would in principle be simply an ordinary railway tire bar straightened, and the tire simply a rail bent into a circle. These alterations, Mr. Holt contended, should make no difference in the conditions of draught, which when on the metals should be fully as easy and safe as a railway, and when on the roads identical with the ordinary street lorry. He handed round copies of a pamphlet giving woodcuts of the vehicle under which horse as well as under steam traction and containing sundry other illustrations of the system and some calculations of its cost, profit and general advantages to trade. Mr. Holt contended that by the avoidance of unnecessary expense so cheaply might the system be worked that calculations showed that a good profit might be realized at a rate of one penny per ton per mile plus a ninepence terminal for full loads of undamageable goods, or general goods on which claims for damage were agreed to be foregone throughout all Lancashire. He explained the circumstances of the abortive bill of 1881, and also laid before the meeting the plans on which the project would be placed before the public as soon as that impossible "Will o' the Wisp" was settled. The list of assistant promoters was probably the best that ever joined for one object in Liverpool. To them he hoped to add concurrent support from Manchester and the manufacturing districts, and so supported anticipated being able to carry a bill through Parliament despite the opposition of the present carriers. He also believed in being able to convince investors that the project would be profitable, and animated by a firm belief that in the present state of engineering science the plateway system is far the best for a district like Lancashire, where the trade is large and the distance is short, he proposed to persevere when circumstances were fitting.

FAST TUNNEL WORK.

In the tunnel taken out for use of the southbound track at Factoryville, Pa., on the main line of the Deleware, Lackawanna & Western Railroad, the heading was driven during the month of April, 1883, 471 ft. The new tunnel being parallel to the old one, and 16 ft. of rock left between them, it was found necessary for ventilation, as well as convenience, to draw a 7 ft. cross-cut through from the new to the old tunnel. There were no shafts. The cross-cuts driven in April were two, size about the same as the heading, 7 by 16 ft., making a total heading of 503 ft. Nature of rock blue, red and gray sandstone, making a good roof, with no arching necessary. The drills used were two Ingersoll, supported on columns, in each heading. The system of work was taking out the center cut. The heading was driven in two ends and 11-hour shifts. The drills were worked by compressed air. Benches followed the heading, both worked at the same time. Care was used, which necessitated lighter blasting on account of the old tunnel, about 40 trains passing through it every 24 hours each way, making it necessary to look after the safety of about 80 trains.

The work was divided as follows:

North end 246 ft. heading and 16 ft. cross-cut.....262 ft.
South end 225 " " 16 " .....241 "

This made the total of 503 ft. for the mouth.

—*R. R. Gazette.* C. C. R.

NEWS OF THE WEEK.

THE ST. LAWRENCE BRIDGE.—*To the Editor N. Y. Times:* I have read with much surprise a statement in your issue of Tuesday last respecting the Ottawa, Waddington & New York Railroad and Bridge Company, which is very much calculated to injure the prospects of our undertaking, and I beg to inform you that the Dominion Government have not objected to us bulding a bridge over the River St. Lawrence, for which they granted a charter on May 17, 1882, and for which a joint resolution was passed in Congress on the 3d of June, 1882, authorizing the construction of said bridge, which we intend carrying out, submitting for approval to the Executive of the United States and to the Dominion Government our plans of bridge, which is only necessary before operations are commenced.

T. BROWN ALDERSON, President.

NEW YORK, Wednesday, Nov. 21, 1883.

IN THE SLEEPING CAR.—Very amusing incidents sometimes happen in sleeping cars, owing to the ignorance of untraveled people as to utilizing the limited facilities for disrobing, etc. An occurrence of this kind took place on the Bee line a few days since, which caused some consternation among the ladies and considerable amusement to the male passengers. A nice-looking old couple were seated in one of the sections of the New York sleeper, and, beyond being a little restless, attracted no special attention until leaving the Grand Central Station. Immediately after the train pulled out, the old gentleman stopped a brakeman who happened to be going through the train, and told him they wanted to go to bed. He was referred to the colored autocrat who presides over that department and gives an able imitation of a man blacking boots. After some little talking the old gent explained his wants, and his berth was made up. He then wanted to know where the dressing-room was, and the ladies dressing-room being pointed out, both he and his wife entered. Although this was a rather unusual proceeding, nothing was said about it, and as the

train leaves about 6 o'clock in the evening, and it was a little too early to go to sleep, the balance of the passengers distributed themselves around the car and nothing more was thought about the old couple until a slam of the door and a snort of laughter from some innocent youth attracted the attention of all the occupants of the car to a grand triumphal march executed by the old couple from the dressing-room to their berth. They had disrobed in the ladies' dressing room, and the old lady had apparently nothing on but her "robe de nuit" and a night cap, and the old gentleman brought up the rear with his clothes and those belonging to his wife in his arms, being almost completely hid in a mass of female attire not generally exposed to public gaze. It is needless to say that the genuine innocence of the old couple in the whole matter was so apparent that it protected them from any rude comment, but after they had piped down it kept the passengers in a smiling mood the balance of the trip.—*Cincinnati Inquirer.*

A SINKING MOUNTAIN.—One of the most extraordinary of the many disturbances of the earth's crust which have occurred during the last two or three years is the sinking of the mountain of Naiba, in Algiers. This mountain, which is or was twice as high as the Crow's Nest on the Hudson, is said to be gradually descending into the bosom of the earth, a deep excavation being formed all around as it settles. There are several intances on record of volcanic mountains having risen out of the earth or the sea, and a few of mountains which have sunk into the earth. The Japanese have a legend that the great olcanic peak of Fusiyama rose suddenly out of the earth, and it is known that in 1759 the volcano of Jorullo, in Mexico, rose in one night out of a cultivated plane. In 1881 there was a similar occurrence in San Salvador, a volcanic hill rising suddenly out of the middle of the Lake of Ilopango. But in these cases the phenomena of the rising mountains were accompanied by earthquakes and volcanic eruptions. So the recent disappearance of volcanic islands and the thrusting up through the bottom of the sea of sixteen new volcanoes near Java were the accompaniments of a great convulsion of the earth's crust. But the sinking of the Algerian mountain, it appears, is not attended by earthquakes and is not the result of a volcanic eruption. The subterranean props of the mountain seem to have given way under its weight, and it is subsiding into the ground.

THE ST. LOUIS PAVEMENTS.—The members of the Board of Public Improvements, after several years contest with limestone macadam contractors have concluded to assertain if a substitute for limestone can be obtained. A report commences with a statement that the board has long recognized the importance of discovering some hard and durable rock to take the the place of the soft limestone which is now used in the macadamized streets of the city. The board recomends as a substitute chert, which consists of silica, with an admixture of carbonate of lime. It is very hard, it is not affected by atmospheric action, and can be quarried and broken to proper dimensions at a very small cost, viz : Grubbin, 40 cents per square ; sledging, 80 cents per square ; washing, etc., 45 cents ; loading, 5 cents ; freight, $2.60 ; unloading, 50 cents ; hauling, $1.50 ; incidental expenses, 64 cents, or a total expense of $7 per square, The plant required for furnishing 100 squares per day would be $6,000. But before any definite movement is made the board recommends a practical test, and asks for an appropriation of $2,500 for that purpose.

Articles of incorporation have been recorded with the Clerk of the Circuit Court at Freeport, Ill., for the purpose of building a railroad from Freeport to Galena, with a branch line running from the Chicago & Northwestern at or near Fulton. The incorporators are Albert Keep, Marvin Hughitt, J. B. Redfield and E. H. Johnson, of Chicago, and others, all Chicago & Northwestern men. The capital stock is 3,000,000.

CANADIAN PACIFIC STOCK.—MONTREAL, Nov. 22.—A letter has been published here signed by George Stephen, giving notice that thirty days after date the Canadian Pacific Railway Company will issue the balance of its authorized capital stock, amounting to $45,000,000.

THE BLOOMFIELD & BEDFORD EXTENSION.—INDIANAPOLIS, Ind., Nov. 20.—The Indianapolis Rolling-Mill Company has decided to build an extension of its Bedford & Bloomfield road, from Bloomfield to Worthington on Tuell's Terre Haute & Southeastern road. The latter has offered to the rolling-mill company the right of way over an old canal-bed if the extension will be agreed upon. This will give the Bedford and Bloomfield a Terre Haute outlet, whence Chicago and St. Louis may be reached.

THE Evansville (Ind.) Bridge is progressing rapidly.

THE NEW YORK, SUSQUEHANNA & WESTERN Company has concluded arrangements and signed contracts this week which will result in a considerable increase in the coal output in the Scranton district. Two new coal-breakers and shafts have been completed and quite a number are under construction.

THE PRICE OF BESSEMER RAILS.—The decrease in railroad building has brought down the price of Bessemer steel rails to $35 per ton. At one time the price was $150 per ton. The decline is partly owing, however, to cheapening facilities. There is no immediate prospect of an improvement, either in demand or prices.

STAFFORD (Mass.) is to vote on the 30th on a proposition from the Aqueduct Company, with regard to bringing water to the town.

THE Amherst (Mass.) water-works will soon be completed.

THE SURVEYORS on the Franklin & Somerset (Maine) R. R., who started from North village, are within a mile of the West village. Easy grades are found all the way, and Engineer Thompson is much gratified at the result. Col. Wildes went to Strong, and began the survey of that end of the route. The work will be pushed and the survey completed before cold weather comes on in earnest. The weather is favorable and the survey will be pushed as fast as possible.

THE BIGGEST DRIVING WHEELS.—*To the Editor of the Sun—Sir:* I beg to supplement the communication of C. F. Thomas, M. E., in yesterday's *Sun*, with the statement that the old Camden & Amboy Railroad Company, some twenty odd years ago, had two (and possibly more) passenger engines in service whose driving wheels were exactly eight feet in diameter. They were employed in drawing trains between Trenton and Philadelphia and between Trenton and New Brunswick, which latter city in those days marked the terminus of the Camden & Amboy Railroad. I have ridden behind these engines many a time. They had 38-in. stroke, and instead of four small wheels in front had six. The immense size of the driving wheels made it necessary to place the axle behind the boiler, above which was the engineer's cab. The spaces between the spokes of the driving wheels were filled with wood painted yellow. They were odd-looking structures, the enormous height of the drivers and cab giving them the appearance of standing on their heads. In going around a sharp curve they resembled a saffron-hued cyclone. They made good speed, but nothing extraordinary. The location of the boiler threw the principal weight on the small wheels in front, and the engines always had difficulty in starting a heavy train. The driving wheels slipped a good deal, and it took a long while for them to gain headway. Respecting the statement of Mr. Thomas that any engine ever attained a speed of a mile in thirty-five seconds, or over one hundred miles an hour, he surely must be in error. Actual test has proven that the greatest speed is not gained by the largest driving wheels, but by a happy medium, which the new engines of the Pennsylvania Railroad seem to have struck. E. S. E.

TRENTON, Nov. 15.

To the Editor of the Sun—Sir: The Caledonian Railroad in Scotland has no passenger engines with driving wheels under eight feet in diameter, and a few years ago it had a few with nine feet drivers. I think if Mr. Thomas cares to inquire he will find the diameters given are quite common on railroads throughout Great Britain. Perhaps these I have mentioned do not relate to the case in point, as they were not cast, but forged.

CHARLES WEBSTER.

POTTSVILLE, Nov. 15.

A MYSTERIOUS SURVEY.—The survey which is in progress of a new line from Dubuque to St. Paul along the east side of the Mississippi River has occasioned an unlimited amount of speculation. All of the railroad systems in the Northwest have been credited with backing the enterprise, but each in turn has been dropped, and the matter remains a mystery, as before. The Illinois Central was first accredited with the responsibility, but from the fact that the Central owns but 81 miles of track over which cars run to Dubuque, this seems highly improbable. The next surmise was that the Chicago, Burlington & Quincy, owner of the other 120 miles between Chicago and Dubuque, was intending to reach St. Paul by the proposed new line.

RAILROAD EXTENSION.—It is announced to-day that with the opening of spring the Chicago, Milwaukee & St Paul company will commence the work of pushing forward a line of road from Aberdeen, Dak., to the Black Hills. The work has been determined upon and the contract for grading will be let as soon as practicable. The line will be run in an almost direct westerly direction from Aberdeen, following for some distance the valley of the Cheyenne River. By the early completion of the road the St. Paul company will secure possession of hundreds of thousands of acres of the finest lands in Dakota which are now a part of the Great Sioux reservation.

NEWTON (Conn.) is to have a public park of 175 acres.

MONTREAL, Nov. 22.—Sheriff Quesnel, of Arthabaska, seized the whole line of the Southeastern Railway to-day, but a compromise was made regarding the movables. The seizure was for a claim of $20,000 by the Township of Wickham. The Sheriff sent to the *Official Gazette* a notice of sale for Jan. 29. Ex-Gov. Hendee, of Vermont, Receiver of the bank at St. Albans in which Bradley Barlow is interested, has been in the city for the past few days, endeavoring to arrange Mr. Barlow's affairs in regard to the Southeastern Road, which are daily becoming more complicated by lawsuits and seizures.

LOCKPORT, N. Y., Nov. 22.—After seven weeks of effort, the $60,000 required for the organization of a company to run a railroad from Attica to Youngstown has been subscribed, and articles of association will be filed immediately. The construction of this road during the coming year is now regarded as a certainty. Its route will pass through Lockport and intersect at least half a dozen railroads between Attica and Youngstown. The distance is sixty miles. The leading spirit of the enterprise is Col. R. S. Stevens, of Attica, a well-known railroad builder and a Representative in Congress from the old Niagara, Genesee, and Wyoming districts.

THE Philadelphia Gas Works will not be sold, the sale being indefinitely postponed by a vote of 62 to 21.

THE PHILADELPHIA GAS TRUST—The purchase of any more three-inch pipe is settled by the Chief Engineer's being directed to purchase 1,000 lengths of it, in twelve-feet lengths. The Chief Engineer and Superintendent of Distribution were requested to furnish the board with a statement of all the pipe required for the ensuing year.

ORIGIN OF MISSISSIPPI.—The Mississippi is a good instance of the variations through which some names have passed. Its original spelling, and the nearest approach to the Algonquin word, "the father of waters," is Moche Sebe, a spelling still commonly used by the Louisiana Creoles. Tonti suggested Miche Sepe, which is somewhat nearer to the present spelling. Father Laval still further modernized it into Michispi, which another father, Labatt, softened into Misispi, the first specimen of the present spelling. The only changes since have been to overload the wordwith consonants. Marquette added the first and some other explorer the second "s," making it Mississipi, and so it remains in France to this day, with only one "p." The man who added the other has never been discovered, but he must have been an American, for at the time of the purchase of Louisiana the name was generally spelled in the colony with a single "p."

NEW MANUFACTURING PROCESS.—PITTSBURGH, Pa., Nov. 22.—A new process in the manufacture of low carbon Bessemer steel was put into operation to-day at the Bessemer Steel Works at Homestead, which, if successful, will completely do away with the work of puddling. A number of puddlers from various mills were present during the experiments and watched the result with great interest.

MORE WATER NEEDED.—NEW BRITAIN, Conn, Nov. 22.—This city has long felt, with its fast increasing population, the necessity of an increased water supply. Manufactories have sprung up thick and fast of late, and as a consequence the demands by householders are imperative. One mile from the city is a lake which is now being connected with the reservoir by a canal 22 ft. in width and 7 ft. in depth. Hartford contractors, Campbell & McNeil, have the job in hand and now employ 125 men, mostly Irishmen. Fifty Italians are expected, but to prevent a war between Ireland and Italy they will be placed on the lake end of the canal. Several deep cuts are necessary, as the country is quite uneven. The canal is expected to be completed about the middle of February, in time to catch the spring rains.

CITY OF PARIS PUBLIC WORKS.—The report of the Public Works Department for the city of Paris, from 1872 to 1881, has just been issued, showing what has been expended on the beautifying and cleansing of the city during that period. The cost of new works has been, in round numbers, 398,000,000 francs, and that of keeping them up is estimated at 256,000,000 francs, being a total of 654,000,000 francs. The details of this large sum comprise for new works: Highways, 191,000,000 francs; traffic improvements, 39,000,000 francs; drainage and sewerage, 47,000,000 francs; lighting, 3,000,000 francs; new promenades, 7,000,000 francs; new public buildings, 20,000,000 francs. For maintenance, the cost of roads and streets is placed at 129,000,000 francs; drainage, 8;000,000 francs; lighting, 78,000,000 francs; promenades, 3,000,000 francs; public buildings, 20,000,000 francs. Taking Paris according to its arrondissements, it seems that the outlay for new works on the first ten was nearly 247,000,000 francs, and on the remaining ten nearly 151,000,000 francs, This increase of outlay is accounted for by the fact that the works of the Hotel de Ville alone figure for 25,000,000 francs, and the Avenue de l'Opera and the Boule-

vard St. Germain for 80,000,000 francs. Under the category of new works, the seventh arrondissement has been the most expensive, costing 33,000,000 francs; but under the head of maintenance the seventh is surpassed by the eighth, which has had 23,000,000 francs spent upon it.

THE WILMINGTON BRIDGE CASE.—This case has been decided at Joliet (Ill.) in favor of the Board of Supervisors. The action was taken to compel them to pay one-half of the cost of the bridge, $30,000.

A TWENTY-FOUR HOUR CLOCK.—A jeweler of Warren, O., has devised a clock for recording time under the new twenty-four hour system, which seems to be just what is needed. The first twelve hours are indicated in the ordinary manner, the second twelve hours, from 13 to 24, are indicated by a circle of figures inside the Roman letters. In recording the first twelve hours the hour hand points to the outer circle, but when noon is reached the hour hand by a very ingenious arrangement shortens itself, and thereafter points to the figures 13, etc., on the inside circle until 24 o'clock is reached, when the hour hand lengthens itself and begins the new day by pointing to the outer circle again.

THE STOCKHOLDERS of the Wilmington & Weldon Railroad passed a resolution Nov. 20, that the construction of a branch road to Florence, S. C., would be at present postponed owing to the evils arising from Southern railroad legislation.

THE SURVEYING PARTIES in the Devil's Lake land district have all gone into winter quarters. They sum up their work since they commenced in June at thirty-one towns surveyed, making 714,240 acres out of 6,410,000 in the district. There are still opportunities for good claims within easy reach of railroads that will be built next year almost certainly.

RIGHTS OF A CONTRACTOR.—In St. Louis Judge Thayer has sustained a demurrer to the petition in the suit of John McCarty vs. the St. Louis & San Francisco Railroad Company. It appears that the plaintiff entered into a contract to do certain work at certain prices, by reason of certain false representations, as to the nature of the work, and false as to the readiness of defendant to have the work begun; that immediately after going upon the ground to prosecute the work the plaintiff discovered the alleged fraud' but went on and completed the contract and was paid therefor the full contract price, and that thereupon the contract was surrendered and canceled. The Judge holds that the law is well settled, that in cases where a party is induced by fraudulent representations to enter into a contract that is purely executory, and there is a timely discovery of the fraud, if the party defrauded thereafter elects to execute the contract and receives the contract price, he cannot maintain an action for damages on account of the fraud originally practiced in procuring him to enter into the bargain.

NEW ROAD IN GEORGIA.—Engineers are surveying a route for a road from Rising Fawn, Ga., to Cole City. The length is eighteen miles.

THE BALTIMORE & OHIO'S NEW LINE is proceeding rapidly under the direction of Col. H. T. Douglass, Chief Engineer, and it is expected that the graduation and masonry for seventy-two miles of the road, which comprises the portion from Bayview to a point eight miles north of Wilmington, will be completed by August 1, 1884. The remainder of the route between Wilmington and Philadelphia has not yet been located, but a party of engineers is now engaged in making surveys in Delaware County, Pa., for that purpose. Plans have been prepared for a bridge over the Susquehanna at Havre de Grace, about a mile and a half above the P., W. & B. bridge, and its construction will be commenced as soon as the contract is finally awarded and signed. Col. Douglass states that he expects to commence work immediately. The piers will be of granite, and the superstructure of steel. The bridge, which will have a single track of rail, will be constructed on the "truss-girder" principle, and will be first-class in every respect. Its length will be 6,048 ft., and there will be nine spans, ranging from 300 to 350 ft. It is thought that some difficulty will be experienced in procuring an entry to Philadelphia.

A NEW mining machine has been invented by Benjamin F. Asper, of Pittsburgh. It is said that it will perform the work of twenty miners.

SURVEYORS are to be sent over the Portage Central at once to obtain an estimate of cost.

CANADIAN PACIFIC PROGRESS.—Tracklaying on the eastern section of the Canadian Pacific Railway is being pushed forward with redoubled vigor in view of the approach of winter. The rails have been laid about ten miles beyond Sudbury Junction, which is over 458 miles from Montreal. The contractors have about 2,000 men employed.

THE MCKEESPORT BRIDGE.—The plans for the new bridge over the Youghiogheny River at McKeesport have just been completed by Mr. Lindenthal, the Pittsburgh civil engineer. Work has already been commenced upon the stone foundations for the piers. It will be a stiffened suspension bridge 700 feet in length from abutment to abutment. There will be two channel piers 320 feet apart. The floor of the structure will be 41½ feet above a full pool stage of water, so that river men will have no cause for complaint. The cables of the bridge will be of steel wire. The bridge will probably be finished by May or June of next year.

THE MANITOBA SOUTHWESTERN.—Chief Engineer Barclay of the Canadian Pacific has returned after a few weeks absence from surveying this line. Two surveying parties are in the field and have located a line from Maryland to Swan Lake.

WORK in the Pennsylvania R. R. shops is very active at present, the car shops in filling an order for 500 refrigerator cars, at the rate of sixteen cars per day, in addition to the cars of other classes, which are being built, and 500 gondola cars have recently been ordered. During the year so far 100 new locomotives of the various classes have been built and about 250 repaired. Thirty-five locomotives were constructed at the Grant Locomotive Works for the company and fifteen at the Pittsburgh Locomotive Works, all of which could have been built at Altoona had not immediate necessity determined otherwise. So far 147 locomotives have been placed on the road. The heaviest locomotive ever built at the shops in Altoona is passenger engine No. 1056, class P. Its weight is 100,643 pounds, and it is designed for the New Jersey division. An order has been given for the construction of six class M shifting engines. They are of the pattern of those already in use in the yard, having the sloping tender. An order for a number of locomotives has also been placed with the Baldwin Works. The foundries are busily engaged in making wheels, switches, frogs, water cranes and other work.

The Pennsylvania Railroad Company is steadily extending the third and fourth tracks on its main line, in order to facilitate the movement of the enormous traffic it is now handling, and which is constantly growing. The company is not only using all its available cars, but has been compelled to lease from other companies several hundred freight cars while additional rolling stock is being built. The Pennsylvania Railroad is now the largest coal and coke carrier in the United States.

NEW INDIANA ROADS.—In Huntington County, Ind., there are several railway projects in course of development. There is a proposed road from Indianapolis to Fort Wayne, through Huntington, and another known as the Fort Wayne, Peoria and Galesburg. The old Wabash and Erie Canal lands from the Ohio line to the village of La Gro have been conveyed to Wm. H. Vanderbilt. It is also proposed to build a road connecting Huntington and Union City.

THE new Kentucky and Indiana bridge at Sand Island is being pushed forward to completion.

RAILWAY CONTRACT.—The contract for building the Des Moines, Creston & Kansas City Railway, from Des Moines to Creston, was awarded to Messrs. Holmes, Jackson & Co., of Indianapolis.

THE TEXAS & GREAT NORTHERN.—The charter of this company has been filed. The capital is $2,000,000.

THE Vandalia line will be doubled twenty miles east from Terre Haute.

THE WISCONSIN STATE HOUSE DISASTER.—The inquest was begun on Nov. 15. The testimony of A. C. Nash, of Cincinnati; C. F. Struck, Minneapolis, and J. H. Carpenter, St. Paul—all architects—was to the effect that the brick piers were too few and were faulty in construction.

ORE CONTRACT.—The largest ore contract ever made in the South was closed by Mr. Shook, General Manager of the Tennessee Coal, Iron & Railway Company, with Messrs. G. P. Crutup & Co. The contract runs over a period of six years and is for mining 600,000 tons of ore. Under this contract the ore is mined at about 57 cents per ton and costs from $1 to $1.05 per ton delivered at the furnace.

THE AQUEDUCT EXTENSION TUNNEL, WASHINGTON, D. C.—This work, recently let to Quackenbush & Beckwith, of Herkimer County, N. Y., has been commenced. The tunnel will be one of the longest on this continent; it is 20,826 ft. long, with a section of 7 ft. by 11 ft., entirely through a gneiss rock. The work is intended to increase the water supply of Washington by the construction of a new storage basin of 300,000,000 gallons capacity at the eastern end of the tunnel, taking water by gravity from the Georgetown basin. Major G. T. Lydecker, U. S. Engineers, and Engineering Commissioner of the District, is the Chief Engineer, and Capt. E. W. Hoxie, U. S. Engineers, is engineer in charge.

LARGE IRON WORKS IN SAN FRANCISCO.—The Union Works are erecting a plank for the building of iron ships, boilers and general machine work, that will, when completed, occupy nine acres of land. D. Ernest Melliss, civil and mining engineer, is in charge of the erection. The boiler and blacksmith shop will be 135 by 200 ft.; machine and erecting shop, 200 by 215 ft.; iron foundry, 190 by 200 ft.; brass foundry and core room, 40 by 80 ft.; engine and boiler room, 50 by 100 ft. 2,000 men will be required for a full run. Traveling cranes of 50 tons capacity, worked by compressed air, hydraulic punching, shearing and riveting plant and all the latest improvements in machines and machine tools are to be supplied.

THE NEW STANDARD.—BOSTON, November 18.—The adjustment of the delicate time apparatus at Harvard College Observatory was begun on Friday. The minutes were first changed, being set back a quarter of an hour. The forty-four seconds were subtracted yesterday, and the operators were engaged from five o'clock until eleven o'clock this morning in deducting the remaining half second.

THE La Crosse, Iowa & Southwestern will be put under construction immediately.

THE Indianapolis and Evansville straight line road was completed last week.

THE Stillwater (Minn.) Electric Light Company has been incorporated. Capital stock, $30,000.

COL. C. C. SMITH, Chief Engineer of the Manitoba Railroad, has prepared plans for the location of the piers in the new Mississippi street bridge, Minneapolis. The spans are to be three in number, 90, 56, and 60 feet in length.

FLORIDA R. R.—Work on the Blue Springs, Orange City & Atlantic Coast Railway is going forward. A mile and a half has been graded, and the way is cut out as far as the Prevatt settlement.

THE Postal Telegraph Company's line is being rapidly built between Chicago and St. Louis.

COLD weather has stopped a great deal of public and private work in the West.

A SURVEY has been made from Profile to the Flume House for an extension of the Bethlehem Narrow Gauge; distance, five miles; elevation, 500 feet. The line runs between the highway and the Pemigewasset River most of the way.

THE WHEELING & HARRISBURG BRIDGE.—Permission has been given this line to build a bridge across the Ohio at Wheeling. It will be one of the highest and have the longest spans of any bridge on the river.

THE CANADIAN PACIFIC laborers have, it is said, commenced suits against the company. They had been engaged at $2 per day to work on the road north of Lake Superior, and 500 of them were discharged.

TWO surveying parties, one in the interest, presumably, of the Chicago, Burlington & Quincy Company and the other employed, as it is authoritatively alleged, by the Chicago & Northwestern Company, are staking out separate roads on what is known as the old Galena and Mississippi intersection right of way between Galena and Savanna, Carroll County, Ill., a stretch of twenty-eight miles, which is claimed by M. Y. Johnson, under a special franchise granted him by the State in 1853. The Chicago, Burlington & Quincy own a road from Sterling, a short distance from Savanna, direct to St. Louis. Their project now is to build a road from Savanna to Galena, thence to East Dubuque and on up the east bank of the Mississippi to Winona, and to the great lumber region of St. Croix. The Chicago & Northwestern design continuing their road from Galena to Savanna, or some other point not yet designated.

KENTUCKY ROAD PLANS.—CINCINNATI, Nov. 22.—It is stated that the property which has lately changed hands in Russell street, Covington, has been purchased for C. P. Huntington and associates in the Kentucky Railroad, for the purpose of extending the road to the river banks, and thence by a bridge to cost $1,500,000 to the Cincinnati side. Since this report has become current property along the proposed extension has advanced from 25 to 50 per cent., the holders believing the road will take it even at the advanced figures. A whole square was recently purchased by Mr. Huntington on this side of the river for freight house purposes, and the rumor that he intends to put a fourth bridge across the Ohio at this point is credited.

FORECLOSING A RAILROAD MORTGAGE.—At the County Clerk's office Troy, N. Y., on the 19th was filed the notice of the commencement of an action of foreclosure of a mortgage of $2,000,000 by the Lebanon Springs Railroad Company to the Union Trust Company of New York.

THE GOVERNMENT OF GUATEMALA has undertaken to build a railroad from one ocean to the other across the republic by means of compulsory contributions. Every male inhabitant of the country who is so fortunate as to earn $8 a month must take one share of the stock, par value $40, and must pay for it at the rate of $4 a year, quarterly in advance. This is an ingenious but inequitable way of taxing the people for the construction of public improvements.

THE Deane Steam Pump Company (St. Louis office) have lately put in two 14×7×16-in. pumping engines at the Springfield Water-Works, a 7×4½×7-in. pumping engine at the establishment of the Keokuk (Ia.) Plow-Works, and a 14×8×12-in. double-plunger pump for parties at Webb City. Their condensing apparatus has recently

been put in the works of the Desloge Lead Company, at Bonne Terre, in the factory of the Quincy (Ill.) Paper Company, and in the establishment of E. W. Sparks, Alton, Ill. The company now have six or seven water-works contracts on hand, and are quite busy both here and at their factory.

BIG LEAK IN THE CROTON AQUEDUCT.—Fissures aggregating 2,000 feet in length were discovered in the Croton Aqueduct in the section south of Yonkers last week. The aqueduct was shut off and the necessary repairs were made. While the flow of water was thus interrupted the supply in the Central Park reservoir was drawn down five feet. In view of the possibility of a recurrence of similar leaks, Commissioner Thompson gives the public notice that he will hereafter shut off the water in all places where persistent waste is discovered.

ARMOURDALE (KAN.) WATER CO.—Capital stock, $100,000. Incorporators, James H. Work, Edward Lyman Short, and Frank F. Wood.

CHAIN OF ROCKS BRIDGE.—The Secretary of State this morning (19th) licensed the Chain of Rocks Bridge Company of East St. Louis, with a capital of $2,000,000. The company proposes to construct a bridge across the Mississippi River not to exceed ten miles above East St. Louis. It is incorporated by Wm. Glasgow, Jr., Erastus Wells, A. F. Hoffer, Thomas Howard, and Frederick Shickle. Nothing appears in the body of the charter to show what interests are to be forwarded by the construction of this bridge.

The mere organization of a company to build a bridge means very little until Congress grants the necessary permission to throw a bridge across a navigable stream at a point indicated as desirable for transportive communication. In the present case no such permission has been obtained. It was sought to be obtained at the last session, but Congress adjourned without acting on the matter. In this regard the Chain of Rocks bridge would appear to be in a decidedly embryonic state.

None of the incorporators are in any way identified with the management of steam railroads. The railroad editor is reliably informed that no railroad man has so far been asked to put his money in the venture, or has planked down the first dollar in this behalf. Nor have the present incorporators purchased or obtained any right of way as yet for any possible future railroad tracks connecting the proposed bridge with the tracks of any road now running on either the east or west side of the river. And it is positively certain that the mysterious surveys made along the east side bottoms below Alton during the summer have no direct connection with this particular Chain of Rocks bridge.

As yet no surveys have been made or any actual work done in regard to the new bridge. The project has attracted some little attention in financial circles, but would-be associates have been barred out with the remark that this was not an attempt to make money by selling a franchise. With the requisite Congressional legislation duly had, the building of such a structure as the present incorporation contemplates would seem very feasible. With a bridge in process of erection the question of railroad connections would be comparatively easy to solve. All of which is respectfully submitted by way of suggestion, as it were, the scheme for a Chain of Rocks bridge being still in the germ. The St. Louis bridge will collect its tolls as usual for some time to come.—*St. Louis Globe-Democrat.*

AMERICAN SECURITIES.—The London *Economist* of the 3d inst., in a leading article, surveys the character of American railway securities. It remarks:

It is almost a self evident fact that, as a general rule, the ordinary shares of American railways are not suitable for English investors, having usually nothing in common with English investments of a similar nature. * * * Again, the ordinary shares are being constantly manipulated for voting purposes, and not unfrequently the policy pursued with regard to them is determined by the consideration of which is the best way of securing the largest amount of plunder from the stock markets. Out of about twenty issues of ordinary shares quoted in the London official list, one-half, which are non-dividend paying, are chiefly of value as gambling counters or voting tickets. Owing to this, it is difficult to fix any real value upon them, and, indeed, the fluctuations in their prices sufficiently denote this. * * * The bond issues of sound American railways stand, however, on quite a different footing. It is a rather curious anomaly that while consols and United States Government bonds yield almost exactly the same interest, yet the prior bonds of first class American railways give an investor from 5 to 6 per cent. upon the money invested, as compared with 3½ and 3¾ per cent. obtained from the similar issues of English undertakings. At present, of course, the want of confidence in American railways affects all their securities alike, but one of the causes especially tending to keep the general level at a low point is the prevalence of insecure issues; and it is apparent that if our surplus capital is to flow into the bonds of American railways greater security must be given. No bonds, for instance, of the character of "income bonds" should be taken by investors in this country. There are no less than fifty of these issues quoted on the New York Stock Exchange, most of which have proved to be, as securities, mere delusions. * * * Before investing in American railway mortgage bonds there are various points which should always be ascertained. Assuming that the financial position is sound, which is best determined by the absence of floating debt and by the net surplus remaining after payment of all funded interest during a series of years, the terms of the mortgage deed itself should then be noticed. The bonds should have a specific lien upon the property, and not, as is so often the case, upon some mere division of the line, which much impairs the value of foreclosure. The total amount of bonds issued should always be less than the total *bonâ fide* paid up stock. Finally, in the interests of English investors, it is advisable that there should be trustees to a mortgage entirely unconnected with the company itself. Other points, such as the necessity for the rendering of regular accounts, might be referred to, but in the meantime these suggestions will suffice, and they will have served their purpose if they draw attention to matters which investors hitherto have too often neglected.

THE SUEZ CANAL.—The Paris correspondent of the *Times* says there is reason to believe that the basis upon which an arrangement is likely to be arrived at between the Suez Canal Company and the English shipowners is that the administration of the company shall be forty-four per cent. English and fifty-six per cent. French; that England as well as France shall be a seat of administration; that all differences that may arise shall be settled by English tribunals, and that all surplus dividends shall go toward the reduction of transit dues in the canal.

This is stated to be the English proposal, but it is generally supposed that M. de Lesseps will not consent to the proposition that all the surplus earnings shall go toward the reduction of the tolls, but will insist that a portion of the surplus shall go to the shareholders. A part of the agreement will be that the English Government shall lend £8,000,000 to help in the construction of a second canal.

A Cairo despatch says it is understood there that the legal advisers of the Egyptian Government decidedly oppose M. de Lesseps' claim to the right to widen the Suez Canal without the permission of the Government.

KANSAS CITY BELT LINE R. R.—Contracts have been let and works begun on this line, a controlling interest having been lately secured by the Santa Fé & Fort Scott Co. The total length of the line, which, with a short piece of existing road, entirely encircles the city, is 6½ miles; the time for completion as specified in the city franchise is extended to June, 1885; the estimated cost is $500,000; Danl. Bontecou is Chief Engineer.

The object of the scheme is to afford a more satisfactory eastern outlet from the city, and also greater facilities for handling local freights of all the roads centering there.

NEBRASKA has been building a great deal of road for some time past.

THE ELECTRICAL EXHIBITION OF PHILADELPHIA.—A circular has just been issued from the Treasury Department by Secretary Folger to the collectors of customs directing that the invoices of all imports intended for the Electrical Exhibition to be given in Philadelphia by the Franklin Institute shall contain a description of the apparatus, its value, and the marks and numbers upon it.

THE Toledo Belt road will be begun immediately with a force of from two to three hundred men.

RAILROAD SURVEY.—The corps of Fort Wayne, Detroit & Canada Southern surveyors that ran a line through Bryan to Fayette and West Unity some weeks ago ran a back track from Fayette to Montpelier; thence due south to a point some two miles south of Williams Center, where they intersected the survey from Fort Wayne to Bryan.

THE CINCINNATI SEWAGE SYSTEM.—Up to 1882 only one-sixteenth of Cincinnati had been provided with sewers. A great deal of work has been done during the past year, and sewers now extend 61 miles. Several large contracts will be given out in the spring of 1884. A great deal of the work has been done under the administration of Mr. H. J. Stanley, the chief engineer.

PANAMA CANAL.—M. de Lesseps, speaking at Manchester, Eng., on the 17th, last night, said that he had received from the engineers of the Panama Canal assurances that the canal would be open in five years.

FIRST AID TO THE INJURED.—The first annual meeting of the Society for Instruction in the First Aid to the Injured was held on Wednesday afternoon. Mr. Cornelius Vanderbilt said that classes composed of eighty employés of the Grand Central Depot had been taught by the society, and that a wonderful amount of good had resulted. President Jay said that the public schools would undoubtedly teach the system of the society. The officers elected are: President, John Jay; Vice-President, H. H. Gorringe; Treasurer, John Paton; Secretary, John B. Pine.

RAILROAD TIME.—He stood at the ticket-window, slowly unrolling an old-fashioned leather wallet, while a dozen impatient men stood behind him, driven to madness by the shouting of the gateman calling their trains. After he got about a yard and a half of wallet unrolled he suddenly stopped and said to the ticket agent:

"Is that clock right?"

"No, sir," promptly replied the agent.

"'Tain't?" shouted the startled passenger, stooping down and making a sudden clutch at a lean and hungry carpet-bag. "'Tain't right? What'n the name o' common sense do ye have it stuck up there for, then?"

"To fool people," calmly replied the agent; "that's what we're here for, to fool people and misdirect them."

"Well, by gol," said the passenger, hurriedly rolling up his wallet, "then I've missed my train. I'll report you, I will."

"Won't do any good," replied the agent. "It's the company's orders. They pay a man $85 a month to go around every morning to mix and muddle up all the clocks so that not one of them will be right and no two of them alike."

The passenger gasped twice or thrice, but could not say anything. The ticket seller went on:

"It's the superintendent's idea. He is fond of fun, enjoys a joke and it does him good to see a man prance around and hear him jaw when he buys a ticket and then finds his train has been gone two hours. It saves him the expense of going to the circus."

"Which way is this clock wrong?" the passenger asked in despairing accents, "fast or slow?"

"Don't know," replied the agent. "That's part of the fun not to let anybody in the building know anything about the right time. All that I know is that it's about ninety minutes wrong, one way or the other."

With a hollow groan the passenger dropped his carpet-bag and wallet, and made a rush for the door, upsetting every man who got in his way. In about two minutes he came back, crestfallen and meek, and took his place at the end of the line. When once more he walked up to the window, he said, as he named his station and bought his ticket like a sane man:

"What made you talk to me like a liar?"

"What made you ask questions like a fool?" answered the ticket man, and they glared at each other for a second, and then the passenger went his way, a madder, but probably not a wiser man. For, although the timepieces at a railroad station are always as nearly accurate as care and electricity can make them, and all the trains come and go by them, yet there are thousands of men and women in this land of free schools who, whenever they travel, never fail to ask the ticket-seller, station-master, usher and gateman, one after another, if "that clock is right?"—*Bob Burdette.*

LOCOMOTIVES OF THE WORLD.—It is estimated that the world's stock of locomotives consists of 66,000; of passenger cars, 120,000, and of freight cars, 500,000. The capital invested in railways, which are in all 200,000 miles long, is £4,000,000,000. The commerce of the seas is carried by 12,000 steamers and 100,000 sailing vessels, whose tonnage amounts to over 20,000,000 tons.

DEEP-SEA LIGHT-HOUSES.—An English engineer proposes to construct light-houses made of a hollow cylinder of riveted iron-work 290 ft. long. The upper section of the cylinder, 160 ft. long, is to be above the water surface, and fitted up for the purpose intended. The lower 150 ft. is to be sunk by water-ballast or other material below the surface, and counteract the effect of wind and waves upon the exposed part. He proposes to anchor the whole structure by heavy steel cables in mid-ocean, and thus permit its practical use by giving telegraphic notice of approaching storms or in-coming vessels.

A HORSE RAILROAD FINANCIER.—A blue car, having on board a stout lady with a basket, a squint-eyed boy, a widow, and five men, was dragged from the switch at Park row and Ann street yesterday afternoon, and went crawling up town at a snail's pace. The conductor collected his first fare from the stout lady, who handed him a dime. He did not give her any change, and, in answer to her look of inquiry, remarked:

"Give it yer further on."

The squint-eyed boy handed him five pennies, and the widow produced a quarter from behind the folds of her heavy veil. The conductor gave her the stout lady's dime, the squint-eyed boy's five pennies, and a promise that he would give her the rest of the change later. He collected half dimes from two of the men, and ran into debt to

the other three. More passengers boarded the car. At Chatham square the conductor was in debt as follows:

Stout lady, 5 cents; widow, 5 cents; woman with baby, 10 cents; short old gentleman, 5 cents; young woman in spectacles, 10 cents; and three men, each 5 cents.

"Say, young fellow," said one of the last three; "just trot out that five cents you owe me. I'm going to get off."

"Guess not, sonny," said the conductor pleasantly, "you've made a mistake."

The passenger had him by the collar next minute, and fairly shook five cents out of him, and then got off the car. Before the conductor could rearrange his collar his other creditors settled upon him in a swarm.

"Give me my five cents," demanded the stout lady, trying to thrust herself before the old gentleman.

"Madame," said the latter politely, but with firmness, "my claim is 15 cents, and is entitled to precedence."

"I want my 10 cents," screamed the woman with the baby resting her offspring on the old gentleman's shoulder, and reaching for the conductor's coat pocket.

The widow, the young woman with glasses, and the two men lent their voices to the general demand. The conductor hastily produced a lot of dimes and nickels from his trousers pocket, and paid up his debts to a cent. The satisfied creditors returned to their seats, and the conductor said, with a sigh:

"It's s'prisin' how ignorant some persons are not to know when a man's short of change."

THE UNHEALTHIEST CITY IN CANADA.—OTTAWA, Ont., Nov. 21.—Alderman Cunningham called the attention of the City Council last night to the fact that Ottawa is the most unhealthy city in the Dominion, the rate of mortality having reached an alarming proportion. Diphtheria of a violent type is prevalent in the town of Hull adjoining.

LOW CONTRACT PRICES.—About 200 bids were presented to the South Pennsylvania Railroad Company for contracts for the building of portions of eighty-five miles of railroad between Harrisburg and Pittsburgh. President Sayre states that he does not think that the awards will be made before the 1st of December, and that the contractors will be notified from the New York office. He is surprised at the low figures of many, and is positive they could not do the work if they were awarded the contract. Some of the bids are 30 per cent. lower than he has ever known such work to be done.

THE Madison State-House accident has developed very contradictory testimony. Mr. Horton, C.E., of Rochester, Minn., testified to the sufficiency of the iron columns.

FEARS OF A WATER FAMINE.—The West Hartford, Ct., series of reservoirs have not been so low for years as at present. Two of them are nearly empty, and only twenty days' supply is on hand.

TESTING AN ELECTRIC MOTOR.—Leo Daft's electric railway motor is at Saratoga, N. Y., and will be tested on the Mount McGregor Railroad this Saturday afternoon. It was tried on a level grade after midnighto n the 20th, and worked perfectly, making 20 miles an hour easily.

THE NIAGARA CANTILEVER.—PROSPECT HOUSE, NIAGARA FALLS, Ont., Nov. 21.—The two ends of the New Michigan Central cantilever bridge across the Niagara River, below the Falls, are permanently connected to-day and a large number of people have crossed it. The formal opening will occur on Dec. 10, when the bridge will be tested by a train of thirty-six locomotives coupled together, which will just reach from end to end. After this a special train will cross, bearing the officials of the Michigan Central and Central Hudson roads together with invited guests.

R. R. CONSTRUCTION NOTES.—Surveys have been begun for the Warrior Coal Fields road from Gainesville, Ala., northward to Bridgeville, about twenty-five miles. Two lines will be run, one on each side of the Tombigbee River.

It is said that the Chicago, St. Paul, Minneapolis & Omaha will next season extend its Neillsville branch from Neillsville, Wis., northeast to Warsaw, about seventy-five miles, through a lumber country.

Work is now in progress on an extension of the Georgia Pacific, from Fayette Court-House, Ala., eastward thirty-two miles to Day's Gap, where several coal-mines have been opened.

A company is forming to build a road from Cave City, Ky., on the Louisville & Nashville road, to Mammoth Cave. The distance is nine miles over a rough road by stage, and it is said this deters thousands from visiting the cave who would go there were direct communication made via Louisville & Nashville cars.

The Youngstown Car Manufacturing Company in Youngstown, O., has its shops full of work.

The Lafayette Car Works in Lafayette, Ind., are building 1,000 box cars for the Lackawanna line.

The Missouri Car and Foundry Company in St. Louis has taken a contract to build 300 box cars for the Texas & St. Louis road.

Work will soon be begun on the Cincinnati, Green River & Nashville Railroad. It yet remains for the country and the property-owners along the proposed line of the road to give the right of way. Where it is impossible to secure a free right of way it will have to be purchased.

The track on the Valley of Virginia road is now laid to Lexington, Va., thirty-six miles south by west from the old terminus at Staunton, and sixty-two miles from the northern terminus at Harrisburg. The road was opened for traffic to Lexington November 1. It is operated by the Baltimore & Ohio Company, which owns a controlling interest in it.

The Texas & St. Louis road has just given orders for twenty new locomotives, 400 box cars, 200 coal cars and 2,000 tons of steel rails.

The work of grading on the northern end of the Michigan, Indiana & St. Louis Railroad was commenced last week. This company was organized in March last, and the prospects are now good for the line being pushed. The road is nearly an air line from Sturgis, Mich., to Danville, Ill., and an extension is projected to Battle Creek to connect with the Chicago & Grand Trunk and Michigan Central.

Track-laying is progressing rapidly on the Milwaukee & Northern's Marinette and Menominee branch, and the bridge between the two cities named will be completed within a week. It is expected that the branch will be ready for regular traffic before the 15th of December.

Waukesha, Mukwonago & Geneva Railway surveyors were put to work on the line this week.

Activity prevails along the Milwaukee & St. Paul's extension from Eau Claire to Chippewa Falls. A gravel and construction train has been placed on the road with a large force engaged in ballasting and laying the steel rails. The ballasting crew is following closely in the rear of the track-layers, and the company say the road is to be completed at an early date.

THE PHILADELPHIA WATER DEPARTMENT.—Chief Engineer Ludlow in his estimates explained that he had made a reduction of $17,634 in salaries. Much discussion followed the consideration of the ordinance making the salary of the Chief Engineer $10,000 a year. Several members of the committee spoke highly of Colonel Ludlow's valuable services and the improvements and savings effected since his administration of the affairs of the department. A compromise was finally reached, and it was agreed to recommend that the salary be made $8,000. The Chief Engineer said that over 60,000 miles of pipe were now on record in the books. To continue the work of surveying for a future water supply, $10,000 was agreed upon; for contingencies, $13,000, and for distribution, or the laying of pipes, $135,000, making a total, for maintenance of works and salaries, of $606,850. For the extension and improvement of works $1,000,000 was recommended, making a total estimate of $1,606,850 for the uses of the department for the year 1884.

CONTRACT LET.—The contract for building a court-house at Coleman, Tex., has been awarded to Messrs. Smith & Butler, of Austin, Tex., for $24,750.

A LONG excursion was that of the Mississippi River committee from Rock Island to New Orleans. The United States engineers in charge of the several sections accompanied them. Major McKenzie from Rock Island to St. Louis. Major Ernst from St. Louis to Cairo. Capt. Knight from Cairo to Memphis. Major Miller from Memphis to Vicksburg. Capt. Marshal from Plum Point to Vicksburg, and Major Stickney to New Orleans.

COVINGTON (Ky.) is trying to obtain water from Newport, and a memorial is to be presented to the State asking for $500,000 for the purpose of making a connection.

A VALUABLE DISCOVERY.—The engineers of the Brooklyn City Works Department have discovered that there exists at the bottom of a well dug about a year ago in the vicinity of Smith's Pond a spring which increases Brooklyn's water supply about 1,500,000 gallons daily. The cost of digging the well and lowering the flume to Smith's Pond was $15,000.

MEXICAN RAILROAD NOTES.—The following notes are from the *Mexican Financier* of Oct. 27:

It is believed that by Dec. 1 the entire road-bed of the main line of the Mexican Central will be graded. The most of the contractors will then go over to the Pacific line, the construction of which will probably be pushed rapidly from the junction with the main line at Lagos, in order to give communication with Guadalajara, the second business city of Mexico, as soon as possible.

The length of the Mexican Central from Mexico to Paso del Norte will be 1,932 kilometers, or 1,210 miles.

When it was first proposed to start a street railway in Chihuahua, many persons who did not know that there is hardly a town in all Mexico where a street railway has not proven most profitable, sneered at the idea, and predicted failure. But the enterprise has already proven so successful that it is proposed to extend the track from the Plaza to and along the Alameda. The company has also established a freight-car service, running from the Mexican Central station into the city.

The patronage accorded the three stage lines running daily from Parral to Jimenez, on the Mexican Central, indicates that the proposed railway branch from the Central to Parral will be highly successful.

The inspection of the section of the Mexican National, from Acámbaro to San Luis Potosi, for the month of September, shows that the grading and track-laying between Acambaro and Salvatierra having been completed, the work on the masonry for the 18 bridges and 52 culverts was continued. Early in September the fine iron bridge over the Rio Lerma was finished. The work of replacing with better material the earth-ballast on the track between Salvatierra and Celaya will be finished in about two months. On the third division 800 men were employed during the month. The survey of the line between Celaya and San Luis Potosi began on June 11, 1882, by Engineers Burr and MacAlpine. Mr. Burr made the survey from Celaya to the Rio de Dolores, 96 kilometers, and Mr. MacAlpine located the line from San Luis Protosi to the same river, 143 kilometers. The average maximum grade is ½ per cent., and for short distances it is 1 per cent. The maximum radius is 72 meters. The grading was begun last April, and at the end of September was completed as far as San Miguel de Allende, 56 kilometers, and work is now proceeding on the section between the latter place and Atotonilco. The track has been laid from Celaya to Soria, 16 kilometers, and now that the work to Morelia has been finished, the track will be rapidly laid as far as San Miguel. The number of workmen for the month on this division was 2,000.

The track of the Mexican International Railway (Huntington-Frisbie) has been laid as far as kilometer 150, and will soon be completed as far as the place called Dos Hermanos, where there are warm springs, making 200 kilometers in all.

The government of the State of Morelos has authorized Mr. Isidor Berthier to organize a company to build a railroad from Cuernavaca to Toluca. Mr. Berthier proposes to organize the company among French capitalists. The terms of the concession guarantee an annnal interest of 10 per cent. upon the capital. The railway will traverse the rich valley of Cuernavaca, exchange the products of the cold and hot lands between Toluca and Cuernavaca, respectively, and also form an important feeder to the Mexican National and the Interoceanic. This is the first railway enterprise in this country to engage French capital.

THE TEHUANTEPEC SHIP RAILROAD.—The following extracts from an interesting letter from one of the leading engineers of the Eads ship railroad have been furnished to the Panama *Star and Herald*:

"Since I wrote you I have been all over the isthmus on foot and on horseback, in steam launches or in canoes. I have found that all previous surveyors seemed to take it for granted there was but one route across on the Atlantic side, and one expedition after the other had blindly played follow the leader over it. This route had wagon and mule roads along it the whole way. Finding indications of better country for our purposes, but in the woods, I went into it, leaving the wagon and mule roads, and by dint of some good hard work have succeeded in procuring a line over the roughest section of the isthmus that had most agreeably surprised our people in New York, as it was entirely unexpected. The first transit line ever run across the isthmus was finished by us on August 16 last—distance being 150 miles. You can form an idea of the difficulty of securing a good line when one is not permitted to use any curves of less than 15 miles radius. I was in Suchitan and Tehuantepec the middle of last month and came over here to Minatitlan by order of my chief for consultation. He has since left for New York. I am now here in charge. Everything indicates that this enterprise is going ahead swimmingly."

NEW ORLEANS, ST. BERNARD & PLAQUEMINES.—A peculiar and promising railway project, based on the charter of the New Orleans, St. Bernard & Plaquemines Railroad Company, is attracting the attention of some of the capitalists of that vicinity. The scheme contemplates the erection of a railway 104 miles in length, from a point in New Orleans, where a convenient connection with all the railways now terminating there can be obtained, along the east bank of the Mississippi, to Port Eads, where the jetty system has secured a good channel for large vessels. A liberal charter was granted seven years ago by the legislature of Louisiana, and seven-eighths of the right of way has been secured. Prominent citizens of New Orleans are actively identified with the company, and Capt. James B. Eads, the distinguished engineer who constructed the St. Louis bridge and the jet-

ties, strongly endorses the project as one likely to prove useful and remunerative. The traffic anticipated would consist partly of local business, as cotton and sugar plantations abound on both sides of the river, along seventy miles of the route; but the principal business would probably be furnished by the transportation of inward and outward bound freight along the whole route, inasmuch as extensive warehouses, elevators, cotton presses, and other appliances of modern commerce could be erected at Port Eads, and by their use vessels could be relieved of the delays and excessive charges for wharfage, towing, pilotage, and stevedoring to which they are now subjected at New Orleans. Capt. Eads says he has "no doubt that the road will be a paying one," that he believes "the stock of the road will become quite valuable," and that he would be willing to "receive stock in exchange for land at Port Eads."

REPORT OF THE UNITED STATES ENGINEERS.—The United States Engineers' office reports for the month of October show very good progress in the improvement of Bayou Black. There was dredging to the amount of 19,285 cubic yards in a distance of 2,755 ft., and the removal of sixty-five logs, trees and stumps. Work has been going on slowly on Pearl River, on account of the low stage of water. The boats intended to improve the portion of Pearl River from Jackson to Carthage have been completed, but have been unable to commence work at present because of low water.

THE PRELIMARY SURVEY of the projected railroad to connect Montgomery (Ala.) and Prattville, and continue thence to Florence, has been commenced, Mr. H. E. Rosenstock, civil engineer, is in charge of the survey.

RAILROADING IN MEXICO.—Major D. B. Robinson, General Manager of the Mexican Central, was lately tendered a banquet in New Orleans. He stated that the Mexican Government had issued to the several States in the Republic liberal concessions for the construction of railroads. These were assumed by the Mexican Central Railway Company and merged into one general concession, which embraced a line between the city of Mexico and El Paso, Texas, and from Tampico, on the Gulf of Mexico, to San Blas, on the Pacific coast, in all a distance of over 2,000 miles, the Government guaranteeing a cash subsidy of $14,500 per mile. The company is working Mexicans and Indians almost exclusively as laborers, skilled labor being mostly Americans.

THE CANADAIN PACIFIC.—Major A. B. Rogers, engineer in chief of the Mountain division of the Canadian Pacific, is in Montreal. He is on his way to headquarters from the Rocky Mountains, where he has been at work for several months past. Speaking of Kicking Horse Pass, and the reports that it would be abandoned, the major said his impressions were that they cannot abandon it. It is thirty miles shorter than any other possible route, and taken in connection with the light work in the Columbia Valley, which would otherwise be avoided, it will prove the line of easiest construction, and by far the best for operation. The only surveys now going on are those necessary to develop the feasibility of the House Pass (called House, the major said, because there was no house built thereon). Either route, the major said, is feasible.

LYNN WATER-WORKS.—Work on the extension of the public water-works in Lynn (Mass.) is progressing very rapidly, and it is expected that the tunnel and trenches will be completed in about five months. Largegangs of men are working at each end of the tunnel, and a shaft fifty feet deep has been sunk in the center.

THE SOUTHERN LEVEES.—NEW ORLEANS, La., Nov. 18.—J. Floyd King. Congressman, hearing of complaints about the progress made by the Government contractors on the levees, yesterday visited Tensas Parish on a tour of inspection. He has forwarded the following to the Secretary of War: "Hard Scrabble and Bon Durant levees, three miles long, through a wooded, low swamp, are uncompleted. About 200 hands are engaged on them. It would require 600 men to complete it before interruption by floods will occur. This structure is a division in charge of Maj. Stickney, United States Engineer. I urge that steps be taken at once to force the contractor to employ a sufficient number of workmen."

LAST week's record of railroad construction in the United States shows that 131½ miles of new road were built, making a total of 5,410 for the year up to the present time, as against 9,102 miles for the corresponding period in 1882, 6,241 in 1881, and 5,056 in 1880.

THE Storkenfeldt's party of surveyors on the Telfener Mexican Railroad have their lines within twenty-four miles of Matamoros.

THE ST. CLOUD (MINN.) WATER-WORKS.—About 3,500 ft. of pipes have been laid. The gas-works are now in running order.

THE Philadelphia Board of Supervisors of the Streets will include the Chief Engineer and Surveyor, the Chief Engineer of the Water Department, the Chief Engineer of the Gas Trust and the Superintendent of the Police and Fire Alarm Telegraph.

A PUNCTUAL CONTRACTOR.—F. S. Blodgett, the contractor on the Oakland and Dale street sewers, St. Paul (Minn.), has finished his work and is ready for the engineer's inspection. His contract time does not expire until June 15, 1884.

A BIG SALARY.—Mr. George W. Ristine will receive $15,000 a year salary as pool commissioner of the California roads. Mr. Ristine is a young man not over thirty-five years of age. Until recently he served as the General Manager of the Texas & St. Louis Railroad.

CHICAGO'S WATER TRAFFIC.—*Bradstreet's*, in a late issue, says there has been a surprising falling off in the shipping business of Chicago this year, the total of vessels and tonnage being less, and the clearings fewer, than in any year since 1878. The tonnage cleared is lower than in any year since 1879. The arrivals for the ten months ending Oct 31 were 10,213, or 1,785 less than in 1882; the tonnage 3 659,851, or 768,979 less than in 1882.

NEW WATER-WORKS COMPANY.—A company has been formed at Dalton (Mass.) to bring water into the town. They will present a petition to the next Legislature to become incorporated with a capital of $50,000.

ITALIAN LABORERS.—The Italian vice-consul at Toronto has had a number of Italian navvies coming to him asking help to send them back to the United States. One Buffalo agent sent over 150, guaranteeing work on the Canadian Pacific Railroad for two years. On arriving they found no work and endured great hardships. The agent falsely stated he was the Italian vice-consul, and charged them each $6.50 fare, which was only $3. Vice-Consul Bendelari has telegraphed to Buffalo, New York and other points, requesting that no more Italians be sent on.

SIXTY MILES of grading has been completed on the Northern Pacific's new line between Minneapolis and Sauk Rapids.

SURVEYOR JACKSON, of the Santa Fe, says that the road they are building from Wichita to Kingman, when finished, will be the best piece of railroad in the State of Kansas, and that the bridge across the Arkansas River is the best bridge of the kind built in the State.

DES MOINES (IA.) GAS-WORKS.—The City Council has under consideration an ordinance extending the term of the gas company's contract fifteen years from January 1, 1885. The rates for private consumers are as at present until May 1, 1884; then $2.25 per 1,000 cubic feet until May 1, 1886; thereafter $2 until the city shall attain a population of 75,000, according to a State or Federal census, when $1.75 shall prevail.

THE Pittsburgh, Cleveland & Toledo will doubtless be extended to some point on the Chicago division of the Baltimore & Ohio.

AN ANTI-TORNADO HOUSE.—A house built to withstand tornadoes—so the Minnesota *Tribune* says—is that of a banker, the wealthiest man in Osakis, Minn. All the corners are acute angles, and the sides sink back into other angles, giving this architectural freak the contour of a star. From the highest point of the roof the gutters sink suddenly, making great depressions. This angularity was, it is said, inspired by the banker's wife, who lives in constant dread of storms. The corners were made very sharp to split tornadoes. The cellar walls are of unusual thickness, and the timbers of the structure are anchored in them, so that the house may not be blown down without taking up the foundations. All the weatherboarding is put on in oblique lines.

CEDAR BLOCKS OR GRANITE.—The St. Paul Council have ordered Third street to be paved with granite, but there is a strong opposition to the material, many citizens preferring cedar blocks, while the views of engineers and contractors are also divided. One engineer insists that owing to the recent depression in lumber prices cedar blocks could be placed for less than one-half the cost of granite. On the other hand, one engineer stated that at present prices of material it would cost about $6 per linear foot to make a cedar pavement, against $8 of granite. Still another engineer, who is also a contractor, stated that he could put down a granite block pavement at much less price than it had yet been done in St. Paul or Minneapolis. The lowest price named for first-class cedar block pavement was $4 per linear foot.

THE Minneapolis street railway has carried 7,000,000 trip passengers during the year, up to the 1st of November, or at the rate of about 8,500,000 per annum.

THE St. Louis Council passed resolutions lately authorizing the board to make contracts for all material for No. 4 pump main and stand pipe connections, and appropriating $64,000 for the work. Authorizing the board to contract for and complete the masonry foundations and procure a high service pumping engine at Bissell's Point, with a capacity of 16,500,000 gallons per day, and appropriating $155,000 for the work.

IRON, METAL AND COAL MARKETS.

PHILADELPHIA.

Iron quotations for this week are as follows: No. 1 Foundry, $20@$21; No. 2, $18.30@$19.50; Gray Forge, $17@$19; Bessemer, $20.50; Spiegeleisen, $29.50@$30.50; Steel Rails, $35@$37, according to date of delivery. Old Rails, $23@$23.60 for tees; double-heads, $24.50@$25; No. 1 Wrought Scrap, $24.50; No. 2, $18@$21; Cargo Scrap, $22.50@$23; Crop Ends, $22.50@$23; Common Iron 1.80@1.90c.; Refined, 1.90@2.10c.; Nails, $2.75@$2.90. Business in Eastern Pennsylvania has been checked by the declining tendency in prices, and the outlook is not in favor of active trade, even at the present unusually low prices. Consumers are light in stocks, but postpone purchases until the market is in a more settled condition. Consumption requirements are not as large as during the summer or early fall, but are larger than would appear from the present demand. A number of furnaces will go out, unless demand improves, for a great deal of iron has been selling at or below cost. A better feeling prevails in standard forge irons this week, on account of heavy purchases made for winter requirements by large consumers. The steel mills are working below full capacity, and dispose of the product with difficulty; margins are very narrow.

PITTSBURGH.

A general downward tendency in prices still continues in this market; mills are closing down; restricting output and declining to accumulate stocks until a change takes place in the market. Quotations are: for No. 1 Pig Iron, $20@$21; No. 2, $18@$20; Bessemer pig, $21@$21.50, four months; Gray Forge, $17.50@$18.50; Steel Rails, $36@$37 early delivery, $35 next year's delivery; Old Rails, $23.50@$24.50; No. 1 Wrought Scrap, $22@$23; Manufactured Iron, 1.80@1.90c; Muck Bars, $32.50@$33.50; Nails, $2.50@$2.65.

The coal trade is comparatively active, although dullness in manufacturing circles checks much demand. Shipments to lake ports and Southern markets continue heavy, and, on the whole, the trade is not suffering from the falling off in demand on account of the decline in iron making.

The glass strike is unsettled, and manufacturers are importing to meet customers' requirements. Hollow-ware, prescription ware, and all kinds of glass are in active demand for Western requirements.

A great deal of apprehension exists here as to the probable course of prices during the winter. The Homestead mill has shut down. The Edgar-Thomson mill will reduce wages 10 per cent. Restriction will be generally resorted to, until the trouble is over. The demand for Merchant Bar still very irregular, even at the present very low prices.

CHICAGO, ILL.

Business in manufactured iron is at a stand-still. Only small orders are coming along. Some makers are pushing sales for cash; it is quite probable that mills will reduce output still farther. About 30 per cent. of the capacity is now idle; quotations, 2@2.10c., but concessions are the rule. Structural iron is in fair demand. Galvanized iron mills busy. Stocks of sheet iron are large and prices weak. Demand for English and Russian iron has fallen off. There is a moderate demand for nails at $2.65@$2.85, according to size of order. Demand for tin plates is not quite as active as usual, owing to the accumulation of stocks in consumers' hands. Low-grade steel is still being cut, and manufacturers are unable to check the decline, although quotations show no change. Ingot copper is selling at 15⅛c. for lake. Large transactions for steel rails are in negotiation; Western mills are not booking many orders, owing to the uncertainty of affairs in the East, and buyers are waiting for a further drop. Southern pig iron is in good demand. Foreigns are quiet. Lake Superior in fair request. Stocks of all kinds have been diminished, and the market is in better condition. The suspension of the Western rail mills prevents any further declining tendency. Building activity continues, and the outlook in that direction is favorable.

COAL.

The coal trade continues steady, and prices for the most part firm. The unfavorable weather along the Atlantic coast for the past two weeks has interfered with the usual shipments East and South; but within the past two or three days the vessels are arriving freely and are being loaded at Port Richmond, where stocks have accumulated to over 100,000 tons. All the companies are rapidly breaking up the larger sizes of coal into smaller, on account of the heavy demand for domestic sizes and the absence of local manufacturing demand. This week's production will be about three-quarters of a million tons. There is some talk of three-quarter time in December, but this will not be resorted to unless demand should fall off. Orders continue to arrive from New England markets and Southern requirements. The bituminous trade is dull. The bituminous operators held a meeting here a few days ago to try to form some plan for restricting production and arresting undue completion.